

حمل الآن

مجاناً وحصرياً

المراجعة رقم (1)

اختبار شهر نوفمبر





First

Multiple Choice Questions

Questions signed by * are answered in detail.

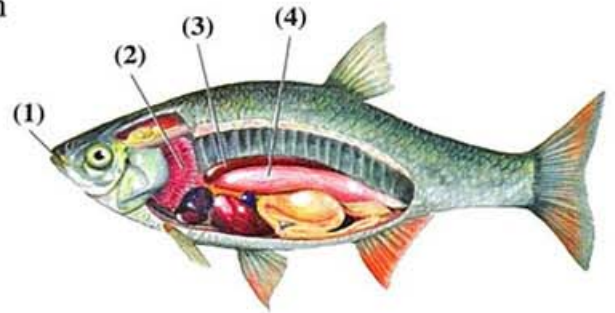
Structural (Anatomical) adaptations

- 1 What does the biological adaptation mean?
 - (a) Changing the conditions of the environment to be suitable for the organisms that live there.
 - (b) The suitability of the organism to the conditions of the environment where it lives.
 - (c) The suitability between chemical and physical properties in the environment.
 - (d) The biodiversity in the environment takes place to keep its balance.
- 2 The structural adaptation of the living organism means the change in
 - (a) the activity of the living organism to adapt with its environment
 - (b) the action mechanism of some living organism's organs to adapt with its environment
 - (c) the physical structure of the living organism that help it to survive in its environment
 - (d) the diet of the living organism
- 3 What is the structural adaptation that allows the icefish to live in the complete darkness?
 - (a) The presence of large eyes.
 - (b) The presence of skin that reflects light.
 - (c) The presence of light-emitting organs (photophores) on the body.
 - (d) The presence of sharp fins.
- 4 Which of the following is/are considered a structural adaptation of some oceans fish to withstand the very high pressure?

(a) Presence of large eyes.	(b) Mucus that covers the body.
(c) Compressed bodies.	(d) Large gills.
- 5 Which of the following structural adaptations help fish to swim effectively?

(a) Large fins and the streamlined body.	(b) Large eyes and air bladder.
(c) Wide mouth and swim bladder.	(d) Transparent skin and specialized gills.
- 6 How does the presence of gills in fish help them to adapt with their aquatic environment?
 - (a) They allow the extraction of dissolved oxygen in water.
 - (b) They help in regulating the body temperature.
 - (c) They act as a foraging tool for food.
 - (d) They help in floating near the surface of water.

- 7 What is the importance of air bladder (swim bladder) for bony fish?
- It helps them to float.
 - It improves their ability to extract oxygen.
 - It reduces the resistance of water against their movement.
 - It enables them to withstand high pressure.
- 8 Which of the following is from the reasons for the presence of special structural adaptations in the deep-ocean fish?
- Low water pressure.
 - High oxygen level.
 - Low light transmittance.
 - Low osmotic pressure.
- 9 The ability of tilapia (boliti) fish to rise to the water surface occurs due to the presence of
- fins
 - gills
 - air bladder
 - compressed body
- 10 Which of the following structures distinguish(es) bony fish from cartilaginous fish?
- Kidneys.
 - Contractile vacuole.
 - Gills.
 - Air bladder.
- 11 Which of the following doesn't/don't characterize the deep-ocean fish?
- Compressed body.
 - The presence of contractile vacuole.
 - Large-sized eyes.
 - The presence of strong arteries.
- 12 Which of the following structures, which exist(s) in the opposite fish, enable(s) it to extract the dissolved oxygen in water?
- (1).
 - (2).
 - (1) and (4).
 - (2) and (3).

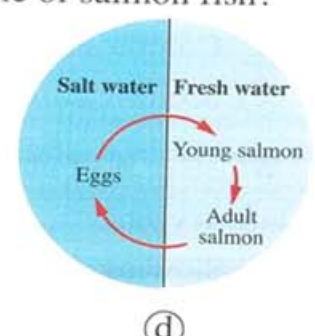
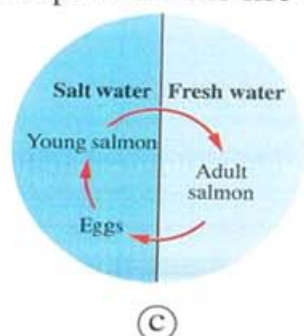
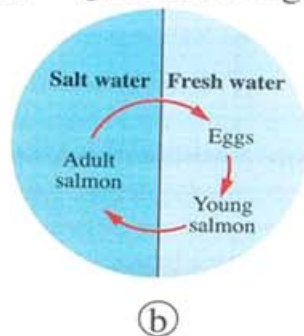
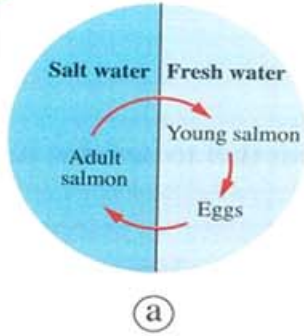


- 13 Which of the following is/are from the structural adaptations of dolphins?
- Large-sized eyes.
 - The presence of large-sized gills.
 - The presence of breathing openings at the top of the head.
 - The presence of air bladder.
- 14 Dolphins are similar to the mammals that live on land in
- the presence of nose
 - the presence of large-sized gills
 - the presence of vertebral column
 - the presence of fins

Behavioral adaptations

- 15 What does the behavioral adaptation of the living organism mean?
- (a) A change in the physical structure to improve the performance.
 - (b) A change in the life style of the living organism to improve the survival chances.
 - (c) A modification in some organs way of performing functions.
 - (d) A modification in the organism blood pressure to maintain its life.
- 16 What is the main behavioral adaptation of salmon fish during their life cycle?
- (a) Changing the skin colour.
 - (b) Migration from the river to the sea, then returning back.
 - (c) Living in ocean only.
 - (d) Living in rivers only.
- 17 Which of the following is an example for the behavioral adaptation?
- (a) Producing sounds by whales to communicate.
 - (b) The venomous spines in the lionfish.
 - (c) Venoms secretion in some species of snakes.
 - (d) The flexible skeleton of viperfish.
- 18 * What is the purpose of the returning back of salmon fish to the place where the eggs hatch?
- (a) Nutrition.
 - (b) Escaping from enemies.
 - (c) Reproduction.
 - (d) Protection from the climate change.
- 19 Each of the following is considered a reason for performing the behavioral adaptation by living organisms, **except**
- (a) avoiding the hardships
 - (b) better usage of the available resources
 - (c) accomplishing the reproduction process
 - (d) being able to breathe
- 20 In salmon life cycle, which of the following stages live most of their life in an aquatic environment with high osmotic pressure?
- (a) Eggs and young fish.
 - (b) Adult fish.
 - (c) Eggs only.
 - (d) Young fish only.
- 21 Which of the following aquatic environments is the best for salmon fish reproduction?
- (a) Seas.
 - (b) Salty lakes.
 - (c) Oceans.
 - (d) Rivers.

- 22 Which of the following diagrammatic figures represents the life cycle of salmon fish?



- 23 Why do salmon fish return back to fresh water after spending most of their life in the sea?
- (a) Because fresh water provides them with the opportunity to reach sexual maturity.
 - (b) Because they can't adapt to salt water for long periods.
 - (c) Because the reproduction process requires a special environment provided by fresh water.
 - (d) Because they migrate to fresh water escaping from marine predators.

- 24 What is the process that is observed in the salmon fish life cycle?
- (a) Adaptation with the high water pressure.
 - (b) Moving between fresh water and salt water.
 - (c) Sexual maturity in fresh water.
 - (d) Reproduction in salt water.

- 25 Salmon fish can adapt to

- (a) high pressure
- (b) low light intensity
- (c) the difference in water salinity degree
- (d) the increased temperature of water

Physiological (Functional) adaptations

- 26 Which of the following expresses the physiological adaptation of the living organism?
- (a) A modification in the physical structure of the living organism to be suitable with its environmental conditions.
 - (b) A modification in the behavior of the living organism to be suitable with its environmental conditions.
 - (c) A modification in the living organism's way of action to perform some vital functions.
 - (d) The migration of the living organism from its environment to reproduce.
- 27 What are the types of adaptations that deep-depths fish use to adapt with the high pressure of water?
- (a) Structural only.
 - (b) Physiological only.
 - (c) Structural and physiological together.
 - (d) Structural and behavioral together.
- 28 Viperfish adapts to high pressure in deep depths through
- (a) having flexible skeleton
 - (b) slowing down the metabolic rate
 - (c) increasing the cellular respiration rate
 - (d) increasing the haemoglobin level in its blood

- 29 Which of the following is/are considered a physiological adaptation in the oceans fish?
- (a) Compressed body. (b) Strong arteries.
(c) Modification in blood pressure. (d) Large-sized gills.
-
- 30 Which of the following physiological adaptations enables the deep-ocean fish to survive with low oxygen?
- (a) Slowing down the metabolic rate. (b) The compressed body.
(c) The increase of salts concentration in cells. (d) The strong blood vessels.
-
- 31 * Which of the following is an example for the physiological adaptation of the living organism?
- (a) The secretion of venoms by snakes to protect themselves from enemies.
(b) The modification of the whales limbs to help them in swimming.
(c) The migration of birds due to the difference in the periods of lighting and darkness.
(d) The sharpness of the eagle beak to tear out the prey.
-
- 32 Which of the following expresses correctly the physiological adaptation of a living organism?
- (a) Modifying its behavior.
(b) Changing in the structure of some of its organs.
(c) The absence of some body structures.
(d) Decreasing the need for oxygen gas.
-
- 33 Which of the following organs has/have a major role in getting rid of excess water in the freshwater fish?
- (a) Swim bladder. (b) Mouth. (c) Gills. (d) Kidneys.
-
- 34 Which of the following organs is/are common between freshwater fish and most saltwater fish for osmotic adaptation in their environment?
- (a) Contractile vacuoles. (b) Skin cells.
(c) Air bladder. (d) Kidneys.
-
- 35 Which of the following types of water has a higher osmotic pressure than that of the body fluids inside the living organisms that live in this water?
- (a) Oceans water. (b) Rivers water.
(c) Springs water. (d) Freshwater ponds.
-
- 36 Which of the following organisms has the ability to adapt with the low osmotic pressure of water?
- (a) Shark fish. (b) Viperfish. (c) *Euglena*. (d) Icefish.
-
- 37 Which chemical substance does the shark fish retain in its blood to help in the regulation of its osmotic pressure?
- (a) Water. (b) Oxygen. (c) Urea. (d) Carbon.

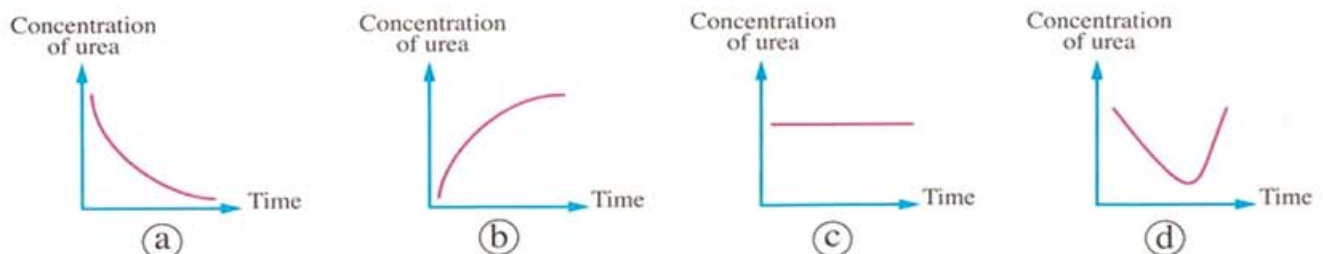
- 38 The kidneys in freshwater fish are different from the kidneys in saltwater fish in
 (a) their number
 (b) the concentration of fluid that they produce
 (c) the type of fluid that they produce
 (d) the main function
- 39 Which of the following is considered a mean for aquatic living organisms to get rid of the excess water?
 (a) The kidneys only. (b) The mouth only.
 (c) The contractile vacuoles or kidneys. (d) Skin or gills.
- 40 The increase in the urea concentration inside shark fish body acts on
 (a) increasing both the osmotic pressure and the water loss
 (b) increasing the osmotic pressure and decreasing the water loss
 (c) decreasing both the osmotic pressure and water loss
 (d) decreasing the osmotic pressure and increasing the water loss
- 41 What is the adaptation that helps the freshwater fish to maintain the osmoregulation inside their bodies?
 (a) Increasing the gills number.
 (b) The ability to excrete large amounts of diluted urine.
 (c) The ability to retain large amounts of water.
 (d) The presence of scales and mucus that cover their bodies.
- 42 How does the excretion of excess salts affect the osmoregulation inside the bodies of some fish?
 (a) It increases the entry of water to the body.
 (b) It causes the loss of large amounts of water from the body.
 (c) There is no relation between them.
 (d) It helps in maintaining the amount of water.
- 43 * The ratio between the osmotic pressure for fresh water to the osmotic pressure for the body fluids inside the living organisms that live in this water is
 (a) greater than 1 (b) smaller than 1 (c) equal 1 (d) equal zero
- 44 The opposite organism is characterized by
 (a) being unicellular and lives in salty environment
 (b) having a higher osmotic pressure inside it than that of its environment
 (c) having a lower osmotic pressure inside it than that of its environment
 (d) having a contractile vacuole to get rid of salts only



45 * Which of the following represents a similarity between *Paramecium* and Nile tilapia (boliti) fish?

- (a) The presence of contractile vacuole.
- (b) The evolution degree.
- (c) The ability to get rid of the excess water.
- (d) The method of getting rid of the excess water.

46 Which of the following graphs illustrates the change in urea concentration in the blood of a shark fish when it moves between two saltwater areas from a lower salinity area to a higher salinity area?



47 The osmotic pressure in the bodies of saltwater fish regarding the water they live in is

- (a) low, causing loss of water from their bodies
- (b) high, causing loss of water from their bodies
- (c) low, causing the entry of water to their bodies
- (d) high, causing the entry of water to their bodies

48 Why shark fish have a higher concentration of urea than freshwater fish?

- (a) Because urea is used as an energy source in their cells.
- (b) Because they swallow large amounts of seawater to compensate the water loss.
- (c) Because they need to excrete large amounts of salts through the gills.
- (d) Because urea helps in the osmotic pressure balance inside their bodies.

49 Which of the following expresses the correct arrangement for osmotic pressure?

- (a) Fresh water < Solutions inside saltwater fish < Solutions inside freshwater fish < Seawater
- (b) Fresh water < Solutions inside freshwater fish < Solutions inside saltwater fish < Seawater
- (c) Seawater < Solutions inside freshwater fish < Solutions inside saltwater fish < Fresh water
- (d) Seawater < Solutions inside saltwater fish < Solutions inside freshwater fish < Fresh water

50 The contractile vacuole in *Amoeba*, *Paramecium* and *Euglena* is an example for

- (a) functional adaptation
- (b) behavioral and structural adaptations
- (c) anatomical adaptation
- (d) osmotic and behavioral adaptations

Second Miscellaneous Questions

1 Write the scientific term for each of the following statements:

- (a) Behavioral or physical traits of the living organism that help it to survive better in its environment.
- (b) A change in the shape and structure of parts of the living organism's body to be able to survive in the environment where it exists.
- (c) Certain behaviors whether they are acquired or inherited to avoid the hardships or to better utilize the available resources.
- (d) A modification in the way that living organism performs its vital functions to be able to survive in the environment where it lives.

2 Give reasons for:

- (a) Bony fish contain air bladder.
- (b) Salmon fish resort to migration to fresh water during their life cycle.
- (c) The suitability of viperfish to live in deep depths.
- (d) Deep-ocean fish have strong and durable arteries and veins.
- (e) The contractile vacuole in *Amoeba* can be known as an osmoregulatory organ.
- (f) Saltwater living organisms cells don't contain contractile vacuole.
- (g) The osmotic adaptation process in freshwater fish is different from that in most of saltwater fish.
- (h) Urea plays an important role in keeping sharks alive in their environment.
- (i) Gills play a mutual role as an excretory organ and a respiratory organ in most of marine fish.

3 What happens in each of the following cases:

- * Salmon fish can't migrate to fresh water.
- * The absence of behavioral adaptations in salmon fish.

4 Compare between each of the following:

- (a) Physiological adaptations and behavioral adaptations in aquatic organisms "according to: definition – example for each one".
- (b) Physiological adaptation for both freshwater and saltwater fish "according to: osmotic pressure of their body fluids - adaptation mechanisms".

5 The opposite figure illustrates a unicellular organism, what

happens if: the malfunction of structure (X) occurs in the organism illustrated in the opposite figure?



6 Explain the ability of viperfish to adapt with the hard environmental conditions where it lives, then determine the type of adaptation.

7 What is the importance of the strong arteries and veins in deep-ocean fish?

8 What is the effect of surrounding environment water on the osmotic pressure of the freshwater organisms cells? And how these organisms adapt with this effect?

- 9 **Illustrate** the adaptation methods of fish to the osmotic pressure effect in salt water.
- 10 Deep-ocean fish adapt with the hard conditions that face them in their environment by two different types of adaptations. **Explain this and mention an example for each one.**
- 11 **From your study, what** characterizes bony fish from other fish?
- 12 Physiological adaptations need structural adaptations to happen. **Mention one example.**
- 13 **How** do icefish adapt with their living conditions? **And what** is the type of this adaptation?

Questions that measure high levels of thinking

Answered in detail

Choose the correct answer:

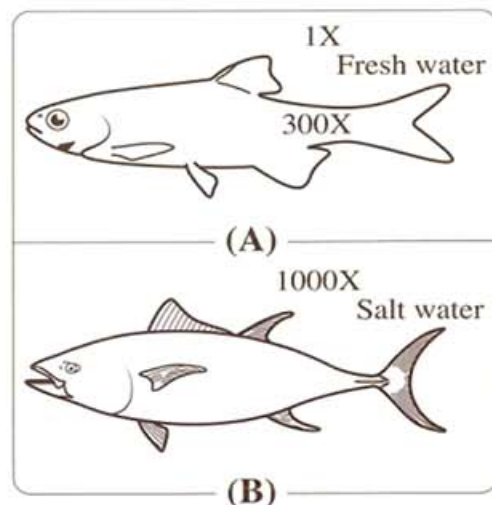
- 1 The opposite figure illustrates two types of fish (A) and (B), if the osmotic pressure of fresh water is (X) and the osmotic pressure of the fluid inside the cells of fish (A) is 300X, answer:

(1) Fish (B) is characterized from fish (A) by

- (a) the osmotic pressure of its cells is lower than that of the environment where it is present
- (b) the osmotic pressure of its cells is higher than that of the environment where it is present
- (c) having a higher percentage of water in urine
- (d) having a lower concentration of salts in urine

(2) The value of the osmotic pressure inside fish (B) body fluid is

- (a) from X to 300X
- (b) from 350X to 1000X
- (c) lower than X
- (d) higher than 1000X



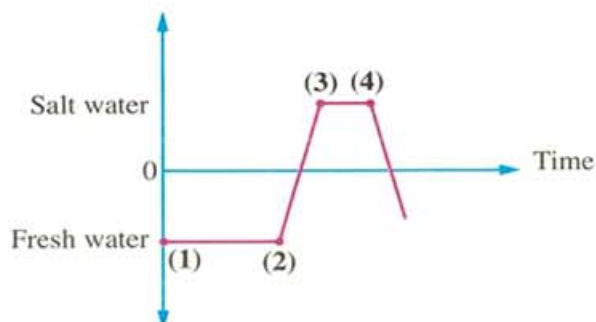
- 2 The ratio between the urea concentration in the blood of shark fish to that in young salmon fish is 1
 - (a) <
 - (b) >
 - (c) ≤
 - (d) =
- 3 Which of the following will burst when putting it for a period of time in distilled water?
 - (a) *Amoeba*.
 - (b) *Paramecium*.
 - (c) *Euglena*.
 - (d) Red blood cell.

Answer the following question:

- 4 The opposite graph illustrates the migration of salmon fish from fresh water to salt water for reproduction, study it, then answer:

What are the numbers of stages that represent:

- (a) The spawning of eggs?
- (b) The sexual maturity?



Questions ?

Unit 1 | Lesson 7

Answered

Effect of Atmospheric Air Gases on Aquatic Environments

Interactive test



First

Multiple Choice Questions

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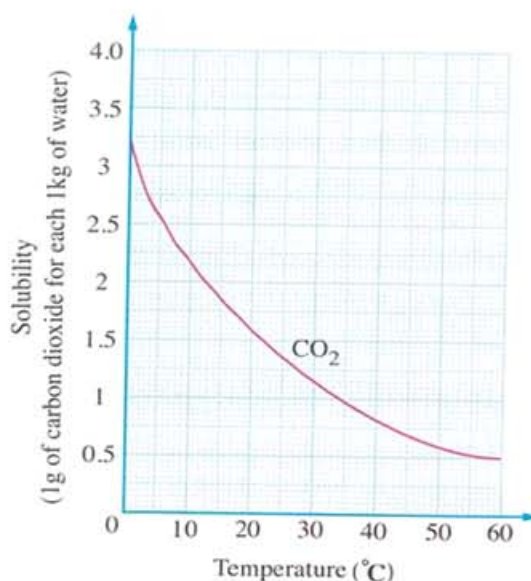
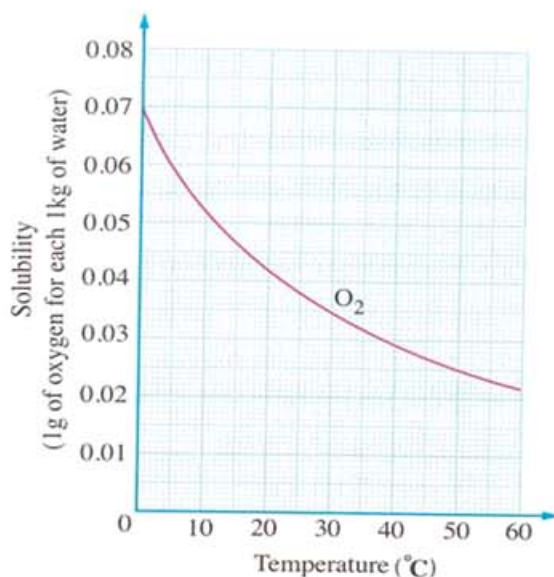
Solubility of the two gases in water

- 1 If the solubility of carbon dioxide gas in water equals X, the solubility of oxygen equals
 (a) 50 X (b) 500 X (c) 0.02 X (d) 0.002 X
- 2 In which of the following the solubility of carbon dioxide is the least?
 (a) Nile river water. (b) Pure water.
 (c) Red sea water. (d) Lake Nasser water.
- 3 The gases solubility in water is affected directly by all the following, except
 (a) temperature (b) the penetration of light.
 (c) pressure (d) the nature of the substances in the solution
- 4 When the temperature of a water body increases,
 (a) the pH value decreases due to the increased solubility of CO₂
 (b) the pH value increases due to the increased solubility of O₂
 (c) the solubility of CO₂ decreases at a greater rate than that of O₂
 (d) the solubility of O₂ decreases at a greater rate than that of CO₂
- 5 The ratio between the solubility rate of CO₂ in water in the summer to its solubility rate in the winter
 (a) is greater than 1 (b) is less than 1
 (c) equals 1 (d) can't be determined
- 6 In the opposite table, the concentrations of O₂ and CO₂ gases in two aquatic environments are recorded. One of them of fresh water and the other of salt water, which of the following leads to these concentrations?

The aquatic environment	The concentration of dissolved O ₂	The concentration of dissolved CO ₂
Freshwater environment	Is high	Is low
Saltwater environment	Is low	Is high

 (a) There are large numbers of aquatic plants in the freshwater environment.
 (b) There are large numbers of aquatic plants in the saltwater environment.
 (c) The absence of fish in saltwater environment.
 (d) The death of fish in freshwater environment.

7 From the two following graphs:



What can be concluded about the effect of increasing the temperature on the solubility of each of O₂ and CO₂ gases?

- (a) The solubility of both gases in water decreases by the same rate when raising temperature from 0°C to 20°C.
- (b) The solubility of both gases in water decreases by the same rate when raising temperature from 20°C to 50°C.
- (c) The solubility of O₂ in water decreases by a greater rate when raising temperature from 20°C to 50°C.
- (d) The solubility of CO₂ in water decreases by a greater rate when raising temperature from 20°C to 50°C.

8 If the solubility of oxygen gas in a sample of fresh water at 20°C is 8 mg/L, which of the following can represent its solubility in this sample at 40°C?

- (a) 6 mg/L
- (b) 8 mg/L
- (c) 12 mg/L
- (d) 16 mg/L

9 * If the amount of oxygen dissolved in 1 L of river water at temperature of 20°C is approximately 10 mg, which of the following can represent its dissolved amount in one liter of ocean water at the same temperature?

- (a) 12 mg
- (b) 7.5 mg
- (c) 5 mg
- (d) 10 mg

10 * The ratio between the concentration of each of carbon dioxide and oxygen gases in the atmospheric air equals approximately.

- (a) 500
- (b) 0.05
- (c) 0.03
- (d) 0.002

- 11 * Which of the following choices expresses the correct arrangement for the solubility rate of oxygen gas in some water bodies?
- (a) Fresh water at 20°C > salt water at 20°C > salt water at 5°C
 - (b) Salt water at 20°C > salt water at 5°C > fresh water at 20°C
 - (c) Fresh water at 5°C > salt water at 5°C > salt water at 20°C
 - (d) Salt water at 20°C > fresh water at 20°C > salt water at 5°C

Oxygen gas (O₂)

- 12 All of the following are considered a source of dissolved oxygen in water, **except**
- (a) algae
 - (b) phytoplankton
 - (c) atmospheric air
 - (d) zooplankton
- 13 Which of the following represents two opposite processes?
- (a) Photosynthesis and cellular respiration.
 - (b) Cellular respiration and acidification.
 - (c) Calcification and cellular respiration.
 - (d) Acidification and photosynthesis.
- 14 What is the main source of the energy required for marine organisms to carry out their biological processes?
- (a) O₂ gas.
 - (b) CO₂ gas.
 - (c) Glucose.
 - (d) Calcium carbonate.
- 15 Which of the following does its increase lead to the increase of the percentage of dissolved oxygen in water?
- (a) The temperature of water.
 - (b) The concentration of salts in water.
 - (c) Air pollutants.
 - (d) Photosynthesis process.
- 16 What is the effect of increasing the concentration of dissolved oxygen in water?
- (a) It helps in completing the photosynthesis process.
 - (b) It supports the growth of aquatic plants and fish.
 - (c) It reduces the pH value of water.
 - (d) It increases the strength of water currents and waves.
- 17 All of the following support the balance of aquatic ecosystem, **except**
- (a) the increase of the percentage of dissolved oxygen in water
 - (b) the diversity of the aquatic organisms
 - (c) the increase of photosynthesis rate
 - (d) the extreme increase of water temperature
- 18 What is the effect of increasing the level of dissolved oxygen in water on the efficiency of the respiration process in living organisms?
- (a) It has no effect.
 - (b) It reduces it.
 - (c) It enhances it.
 - (d) It obstructs it.

- 19 Which of the following increases the activity of fish in the aquatic environment?
- (a) The increase of the percentage of dissolved oxygen in water.
 - (b) The decrease of the pH value in water.
 - (c) The increase of water salinity.
 - (d) The increase of the effects of human activities on water.
-
- 20 * Which of the following factors increases the solubility of oxygen gas in water?
- (a) The increase of water salinity and waves movement.
 - (b) The increase of waves movement and the decrease of temperature.
 - (c) The increase of the pH value and the temperature.
 - (d) The increase of acidification and the decrease of water salinity.

Carbon dioxide gas (CO₂)

- 21 If you have two solutions that are different in concentration which are separated from each other by a semi-permeable membrane (allows the passage of water and dissolved substances), which choice in the following table expresses the property by which each of solvent and solute are transferred between the two solutions?

	Solvent	Solute
(a)	Diffusion	Osmosis
(b)	Osmosis	Diffusion
(c)	Diffusion	Diffusion
(d)	Osmosis	Osmosis

- 22 Which of the following has the main role in the formation of organic substances through the photosynthesis process?
- (a) O₂ gas.
 - (b) CO₂ gas.
 - (c) Glucose.
 - (d) Collagen.
-
- 23 Which of the following decreases the percentage of carbon dioxide gas in water?
- (a) The gases exchange between water and atmospheric air.
 - (b) The respiration of marine animals.
 - (c) Photosynthesis of algae.
 - (d) Industrial pollution.
-
- 24 Which of the following **isn't** considered a source of dissolved carbon dioxide gas in the aquatic environment?
- (a) The atmosphere.
 - (b) Photosynthesis process.
 - (c) The respiration of fish and mollusks.
 - (d) Decomposed organic substances.

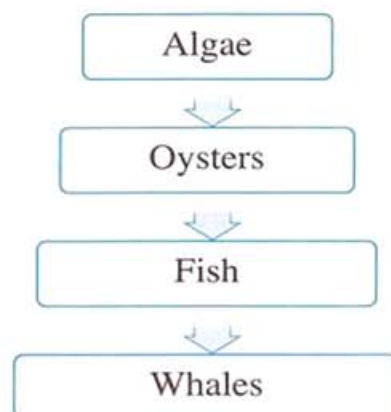
- 25 * Which of the following does its increase in seawater cause harms to oysters and corals?
- (a) Phytoplankton.
 - (b) Carbon dioxide gas.
 - (c) Oxygen gas.
 - (d) Seaweeds.
-
- 26 Which of the following increases the acidity of water in water bodies?
- (a) Increasing the amount of heat absorbed by water.
 - (b) Rainfall carrying carbon dioxide gas.
 - (c) Formation of calcium bicarbonate.
 - (d) Increasing the percentage of oxygen in water.
-
- 27 * The studies have proved that the temperature of the upper part of the ocean water has increased by a certain amount every ten years over the last hundred years. In light of what you have studied, which of the following is from the results of that?
- (a) Reducing the acidity of ocean water.
 - (b) Increasing the percentage of carbon dioxide gas in the atmospheric air.
 - (c) Reducing the percentage of dissolved salts in water.
 - (d) Increasing the percentage of oxygen in water.
-
- 28 * The fall of acid rain saturated with carbon dioxide gas in an aquatic environment leads to
- (a) reducing the pH value of water
 - (b) increasing the calcification rate of aquatic animals
 - (c) reducing the rate of the photosynthesis process
 - (d) increasing the activity of fish
-
- 29 Which of the following is negatively affected by increasing the percentage of CO_2 in the aquatic environment?
- (a) Mosquito larvae and fish eggs.
 - (b) Small fish and aquatic plants.
 - (c) Phytoplankton and mollusks.
 - (d) Coral reefs and algae.
-
- 30 Which of the following living organisms is characterized by the presence of internal skeleton?
- (a) Tilapia.
 - (b) Oyster.
 - (c) Shrimp.
 - (d) Coral.
-
- 31 The skeleton in each of tilapia and dolphin is
- (a) formed of calcium carbonate
 - (b) formed of chitin
 - (c) internal
 - (d) external
-
- 32 * A decrease in the concentration of carbon dioxide in water leads to all of the following, **except**
- (a) increasing water acidity
 - (b) reducing energy produced by aquatic plants
 - (c) reducing energy reaching the predators
 - (d) increasing the pH value of water

- 33 Which of the following organisms in the food chain are directly affected by a decrease in the concentration of carbon dioxide gas in water?
 (a) Whales. (b) Tilapia. (c) Zooplankton. (d) Phytoplankton.
- 34 Which of the following processes leads to an increase in the percentage of carbon dioxide gas in the atmospheric air?
 (a) Photosynthesis process. (b) Rain falling.
 (c) Respiration of animals. (d) Ocean water evaporation.
- 35 Which of the following factors leads to the increase of the percentage of dissolved carbon dioxide gas in water?
 (a) The increase of water salinity and industrial pollution.
 (b) Decomposition of organic substances and decreasing the temperature.
 (c) The increase of the percentage of phytoplankton and increasing the temperature.
 (d) The respiration of aquatic organisms and increasing the water salinity.
- 36 The skeleton of tilapia is formed of
 (a) chitin and calcium phosphate (b) collagen and calcium carbonate
 (c) chitin and calcium carbonate (d) collagen and calcium phosphate
- 37 Which of the following human activities reduces the pH value of a freshwater lake?
 (a) Overfishing.
 (b) Planting trees on the sides of the lake.
 (c) Use sailboats for excursion.
 (d) Throwing agricultural wastewater in the lake.
- 38 Which of the following isn't considered from the results of increasing the percentage of dissolved carbon dioxide gas in water?
 (a) Reducing the pH value of water.
 (b) Increasing the ability of aquatic plants to produce food.
 (c) Conversion of calcium bicarbonate into calcium carbonate.
 (d) Difficulty in respiration of aquatic organisms.
- 39 Which of the following reduces the solubility rate of oxygen in water?
 (a) Dissolving excess of carbon dioxide gas.
 (b) Decreasing the salinity of water.
 (c) Disturbance of water and waves.
 (d) Increasing the efficiency rate of photosynthesis.
- 40 Increasing the percentage of CO₂ in water leads to
 (a) increasing the pH of water
 (b) supporting the respiration of marine organisms
 (c) reducing the efficiency rate of photosynthesis
 (d) improvement the rate of photosynthesis process

- 41 Increasing the percentage of CO_2 in water leads to
 (a) increasing acidification and calcification
 (b) increasing acidification and reducing calcification
 (c) reducing acidification and increasing calcification
 (d) reducing acidification and calcification
- 42 What is the probable result of increasing the temperature of an aquatic environment on the organisms living in it?
 (a) Difficulty in breathing. (b) Increasing photosynthesis process.
 (c) Reducing calcification rate. (d) Increasing activity of living organisms.
- 43 Which of the following is greatly affected by the absence of calcium carbonate in water?
 (a) Photosynthesis process for plants. (b) Respiration of invertebrates.
 (c) Reproduction of fish. (d) Formation of mollusks shell.
- 44 * Which of the following statements is correct about the life in aquatic environment?
 (a) The increase of respiration is accompanied by increasing calcification.
 (b) The increase of organic decomposition is accompanied by a decrease in water acidity.
 (c) The increase of acidification is accompanied by an increase in respiration.
 (d) The increase of water acidity is accompanied by reduced calcification.

- 45 * The opposite diagram represents a part of food chain in an aquatic environment. Which organisms that their growth is directly negatively affected by a decrease or an increase in the concentration of dissolved carbon dioxide gas in water?

	Decreasing the concentration of CO_2	Increasing the concentration of CO_2
(a)	Fish	Algae
(b)	Oysters	Whales
(c)	Algae	Oysters
(d)	Fish	Whales



- 46 * If the energy flow rate that reaches from the green algae to the aquatic larvae that feed on it decreases, it indicates that
 (a) the number of mollusks that feed on larvae increases
 (b) the percentage of dissolved oxygen gas in water increases
 (c) the algae lost their ability to produce energy due to organic remains
 (d) the percentage of dissolved carbon dioxide gas in water decreases

47 When carbon dioxide gas combines with water, it produces

- (a) HCHO (b) H_2CO_3 (c) CH_3OH (d) HCOOH

Second Miscellaneous Questions

1 Write the scientific term for each of the following statements:

- (a) * The ability of the solute to dissolve in the solvent forming a homogeneous solution at specific temperature and pressure.
- * The maximum amount of solute in a given volume of solvent to form a saturated and stable solution at specific temperature and pressure.
- (b) * A biological process carried out by phytoplankton, algae and aquatic plants that plays a role in producing oxygen in water.
- * A biological process through which organic substances are formed in the presence of light and chlorophyll.
- (c) The movement of molecules and ions from a high concentrated medium to a low concentrated medium.
- (d) Reducing the pH value of water.
- (e) An acid formed as a result of dissolving CO_2 gas in water.
- (f) A solid substance that is slightly soluble in water and used in the formation of the shells of marine animals.
- (g) A process on which many marine organisms depend to form their shells and skeletons.
- (h) A water soluble substance is formed when carbon dioxide gas dissolved in water reacts with calcium carbonate.

2 Give reasons for:

- (a) At normal conditions, the ratio between the concentrations of CO_2 and O_2 gases in water differs from their concentrations in air.
- (b) The percentage of oxygen dissolved in Red Sea water is higher than that in water of Suez Gulf.
- (c) The concentrations of CO_2 and O_2 gases in the Mediterranean Sea water is lower than their concentration in the Nile River water.
- (d) High temperatures in the marine environments may threaten the life of aquatic plants.
- (e) The rate of photosynthesis process for an aquatic plant at 20°C differs from its rate at 50°C .
- (f) The high percentage of carbon dioxide gas in the atmosphere affects the pH value of water.
- (g) Changing the pH value of water threatens the life of some living organisms.
- (h) When the percentage of carbon dioxide gas increases in water, the respiration process of marine organisms is negatively affected.
- (i) The high percentage of carbon dioxide gas in water harms some of marine organisms as oysters and corals.
- (j) Food chains may be negatively affected by the decrease in the percentage of carbon dioxide gas dissolved in water.

3 What happens in each of the following cases:

- (a) The occurrence of acidification "**regarding:** the life stages of some aquatic organisms".
- (b) Decreasing the number of phytoplankton, algae and plants from the aquatic environments "**regarding:** the food chains".
- (c) Increasing the temperature of aquatic environment water to 40°C "**regarding:** O_2 and CO_2 gases in water".
- (d) Increasing the percentage of CO_2 dissolved in water "**regarding:** the formation of mollusks' skeletons".

4 Compare between each of the following:

- (a) Oxygen gas and carbon dioxide gas "**in terms of:** the percentage in the atmospheric air - the solubility in salt water and fresh water and at high temperatures".
- (b) Acidification and calcification in the aquatic environment "**in terms of:** concept - the effect on aquatic organisms".
- (c) Calcium carbonate and calcium bicarbonate "**in terms of:** the solubility in water".
- (d) Support structure for each of coral and tilapia "**in terms of:** type of skeleton - the main component of the skeleton".

5 In the light of your study, what are the factors that affect the solubility rate of oxygen and carbon dioxide gases in water?

6 What is the effect of increasing the percentage of oxygen gas dissolved in water on the producer organisms?

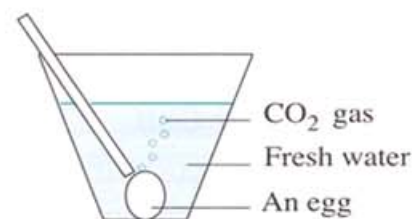
7 What is the effect of decreasing the percentage of carbon dioxide gas on food chains in the aquatic ecosystem?

8 How do waves movement and water currents in ocean help to improve the ability of aquatic organisms to breathe?

9 Explain the effect of decreasing the concentration of carbon dioxide gas in water on the pH value of water.

10 If you know that calcium carbonate is the main component of the egg shell, if an egg is placed in a cup containing fresh water, then carbon dioxide gas is pumped continuously for long period into the cup:

- (a) What is the expected result at the end of this experiment?
- (b) What is the interpretation of this experiment?
- (c) What can be concluded about the effect of this process on the marine environment?



11 How does the decrease of gas resulting from the respiration process in water affect the flow of energy in aquatic food chains?

12 Explain the decomposition of organic substances in water has a role in the photosynthesis process for plants.

13 "The life in aquatic environment depends on a certain range of carbon dioxide gas concentration in water". Explain this statement.

14 Increasing the percentage of carbon in water reduces its pH value, while its decreasing increases the pH value and both negatively affect marine creatures. Explain.

Questions that measure **high levels of thinking**

Answered in detail

Choose the correct answer:

- 1 If the mass of carbon dioxide gas dissolved in 2 L of fresh water is 1300 mg at normal conditions, which of the following can represent the average solubility of gas in salt water at the same conditions?

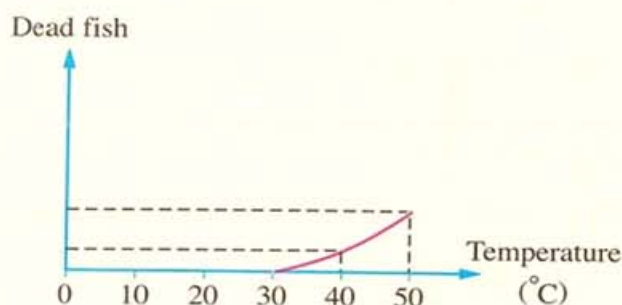
(a) 200 mg/L (b) 488 mg/L (c) 600 mg/L (d) 900 mg/L

- 2 The opposite figure shows some aquatic organisms from (1) : (6) and the pH value of the water that is suitable for their living, which of these organisms is(are) more adapted to increasing the solubility of CO_2 gas in water?



(a) (1). (b) (2), (3).
(c) (4), (5). (d) (6).

- 3 The opposite graph shows the number of dead fish in a lake as its temperature increases in an unprecedented way.



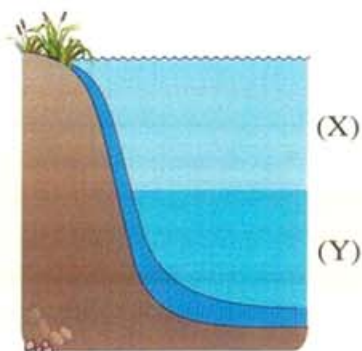
Which of the following reasons is the most likely cause of the fish death?

- (a) High percentage of dissolved oxygen in water.
(b) Low percentage of dissolved oxygen in water.
(c) High percentage of dissolved carbon dioxide in water.
(d) Low percentage of dissolved carbon dioxide in water.
- 4 A plant in a certain aquatic environment converts a percentage (X) of solar energy into chemical energy stored in its food. If the solar energy decreases with time, which of the following accompanies that change?
- (a) Increasing number of mollusks.
(b) Decreasing oxygen percentage in water.
(c) Increasing pH value of water.
(d) Increasing the activity of aquatic organisms.

- 5 The opposite figure shows two regions (X) and (Y) in an aquatic environment, where photosynthesis process is increased in region (X) while decomposition process is increased in region (Y).

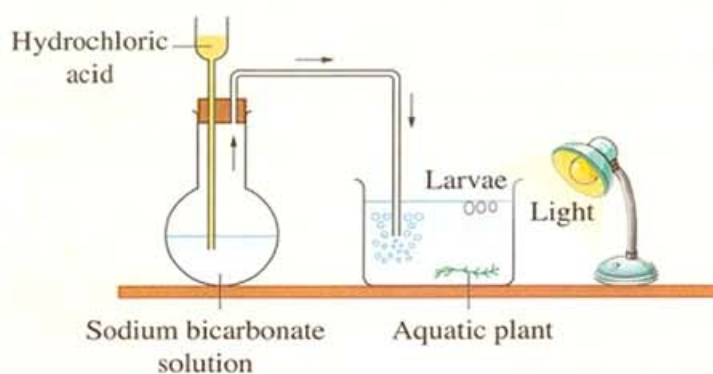
Which of the following is correct?

- (a) The percentage of O_2 in (Y) is greater than its percentage in (X).
- (b) The percentage of CO_2 in (X) is greater than its percentage in (Y).
- (c) The pH of region (Y) is less than pH value in region (X).
- (d) The concentration of O_2 and CO_2 is not affected in both (X) and (Y).



Answer the following question:

- 6 The opposite figure shows the production process of one of the atmospheric air gases, then its passage in an aquatic environment. What are the expected results for the organisms of the aquatic environment after several hours of passing the gas?



Questions

Unit 1 | Lesson 8

Effect of Light and Solar Radiation on Aquatic Environments

Answered

Interactive test



First

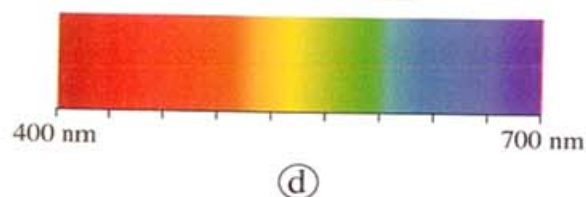
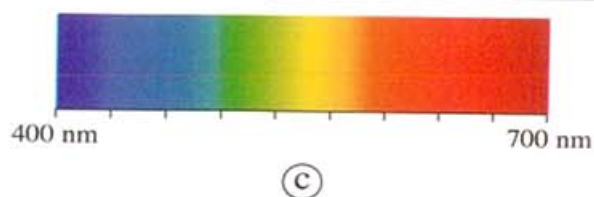
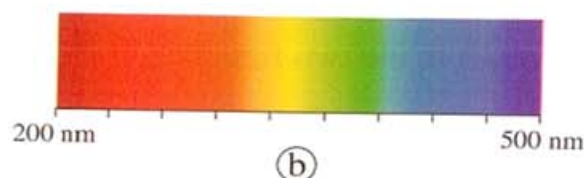
Multiple Choice Questions

Questions signed by * are answered in detail.

Solar radiation

- 1 In which of the following electromagnetic spectrum regions do the waves have the shortest wavelengths?
- (a) Radio waves. (b) Visible light. (c) X-rays. (d) Gamma rays.

- 2 Which of the following figures correctly represents the range of wavelengths of the visible spectrum and the order of its colors?



- 3 The opposite diagram shows four regions in the electromagnetic spectrum, which of the following choices represents regions (A) and (B), respectively?

Region (A)	Visible light	Ultraviolet rays	Region (B)
------------	---------------	------------------	------------

- (a) X-rays, Gamma rays. (b) Infrared rays, Radiowaves.
(c) X-rays, Infrared rays. (d) Infrared rays, X-rays.

- 4 The violet color has among the colors of the spectrum.

- (a) the highest frequency and the longest wavelength
(b) the highest frequency and the shortest wavelength
(c) the lowest frequency and the longest wavelength
(d) the lowest frequency and the shortest wavelength

5 Which two quantities of the following decrease in magnitude with increasing depth in the Red Sea water in summer?

- (a) Water density and its pressure.
- (b) Water density and its temperature.
- (c) Water temperature and its pressure.
- (d) Water temperature and light intensity through it.

6 * Two beams of solar radiation of equal intensity are incident on the surface of water, one is inclined and the other is perpendicular, as shown in the opposite figures, so the reflected light energy from the surface will be



Figure (1)

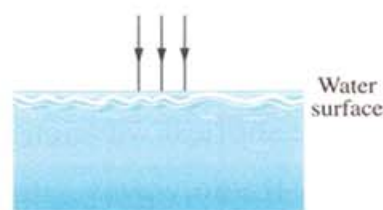


Figure (2)

- (a) greater in figure (1)
- (b) greater in figure (2)
- (c) equal in the two figures
- (d) zero in the two figures

7 In water bodies, the photosynthesis process occurs primarily in

- (a) upper layer
- (b) mid-depth layer
- (c) deep layer
- (d) all layers

8 When solar radiation passes through the surface layer of ocean water,

- (a) the longer wavelengths of visible light are firstly absorbed
- (b) the shorter wavelengths of visible light are firstly absorbed
- (c) all wavelengths of visible light are completely absorbed together
- (d) none of the wavelengths of visible light is absorbed

9 The sea appears blue, among the reasons of that is

- (a) water does not absorb the wavelengths of blue light
- (b) the water surface reflects the wavelengths of blue light
- (c) the wavelengths of blue light penetrate deeper into water compared to other colors
- (d) water absorbs the wavelengths of blue light first

10 When the light reaches a depth of 10 m below the ocean surface, water absorbs approximately of the visible light energy incident on the surface.

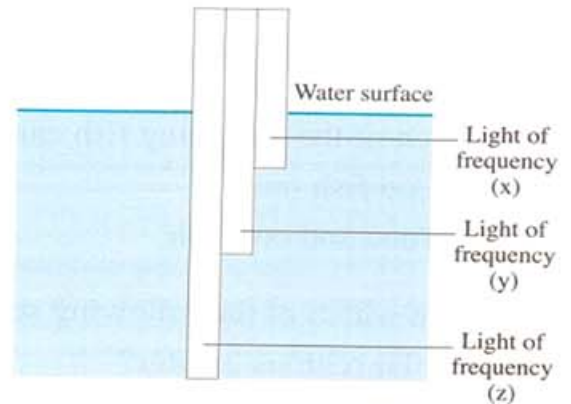
- (a) 20%
- (b) 30%
- (c) 40%
- (d) 50%

- 11 Which of the following electromagnetic rays has its energy almost completely absorbed after 10 cm of penetrating the ocean surface?
- (a) Blue rays. (b) Red rays. (c) Green rays. (d) Infrared rays.

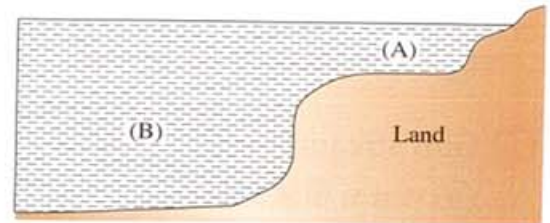
- 12 In clear tropical water, only about of the energy of visible light incident on the surface reaches 100 m depth and most of this light is in the range of light.
- (a) 1% , blue (b) 1% , red (c) 10% , blue (d) 10% , red

- 13 * The opposite diagram shows three beams of visible light with frequencies x , y and z passing through ocean water, so the correct order of the frequencies of these beams is

- (a) $x > y > z$
 (b) $z > y > x$
 (c) $x = y = z$
 (d) $z > x > y$



- 14 The opposite diagram illustrates two different regions of the ocean: a shallow coastal region (A) and an open ocean region (B). How do the colors of the two regions (A) and (B) appear, respectively?



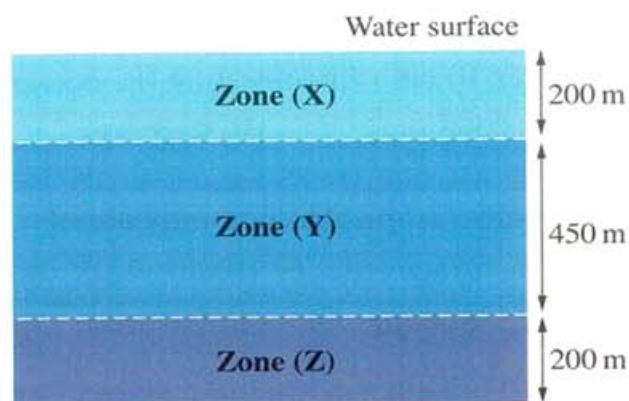
	Region (A)	Region (B)
(a)	Bluish	Greenish
(b)	Greenish	Reddish
(c)	Greenish	Bluish
(d)	Bluish	Reddish

The effect of solar radiation on aquatic environments

- 15 The main condition for the existence of plants in abundance in an aquatic environment is the
- (a) availability of fresh water
 (b) increase in the salinity level
 (c) decrease in carbon dioxide gas level
 (d) availability of suitable amount of light for completing the photosynthesis

- 16 * The opposite figure represents three zones (X), (Y) and (Z) in the ocean water, which of these zones is the most suitable for the existence of autotrophic algae in it?

(a) Zone (X).
(b) Zone (Y).
(c) Zone (Z).
(d) The three zones are of the same probability.



- 17 Which of the following fish can be found in the Atlantic Ocean at the equator?

(a) Cod fish only. (b) Barracuda fish only.
(c) Tuna and cod fish. (d) Barracuda and tuna fish.

- 18 * In which of the following seasons is the decline rate in the marine organisms number in polar regions greater?

(a) At summer. (b) At spring. (c) At fall. (d) At winter.

- 19 From the marine organisms that live(s) in the cold regions is/are

(a) coral reefs (b) cod fish (c) tuna fish (d) barracuda fish

- 20 Gulf stream is an oceanic current that flows towards Western Europe and it is

(a) warm that enhances marine biodiversity (b) warm that reduces marine biodiversity
(c) cold that enhances marine biodiversity (d) cold that reduces marine biodiversity

- 21 What is the main effect of Gulf stream on Western Europe climate?

(a) Reduces temperatures, making the climate very cold.
(b) Reduces temperatures, making the climate more moderate.
(c) Raises temperatures, making the climate very hot.
(d) Raises temperatures, making the climate more moderate.

Second

Miscellaneous Questions

- 1 Give reasons for:

(a) Incompletion of the photosynthesis process in the ocean's twilight zone.
(b) The solar radiation has an important role in keeping the ecological balance in the aquatic environment.
(c) Algae and phytoplankton are abundant in the surficial layers of water.
(d) Coral reefs flourish in shallow water near to the equator.
(e) The decline of solar radiation in polar regions during winter affects the aquatic food chains.

- 2 **What happens when** light is insufficient for coral reefs?

- 3 **What** is the effect of the angle at which the solar radiation falls on the ocean surface on the amount of light that penetrates to water?

- 4 In the light of your study, **compare between** the three light zones in water bodies.

- 5 **How** does light gradient affect the marine organisms distribution in the ocean?

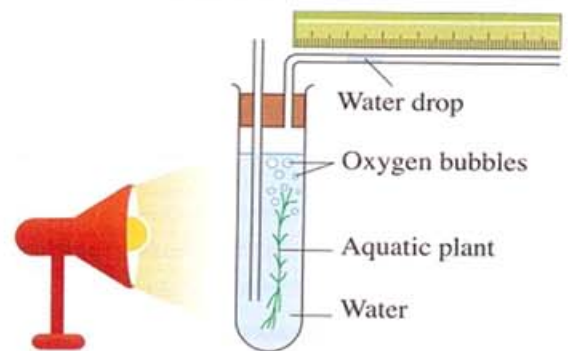
- 6 **Why** is the photosynthesis process important to keep the ecological balance in oceans?

- 7 The water temperatures in the ocean affect the distribution of organisms in it.
Give examples in light of your study.

- 8 **Give an example for the effect of:** Solar radiation on water currents in the Atlantic Ocean.

- 9 The change of climate due to the change of solar radiation intensity may lead to disturbing the ecological balance. **Explain this.**

- 10 **In the experiment illustrated in the opposite figure, the distance moved by the water drop was measured within a time period (t) from exposing the aquatic plant to the lamp light:**
 - (a) **What** is your explanation for the movement of the water drop during the period of exposing the aquatic plant to the lamp light?
 - (b) If the distance between the lamp and the aquatic plant is doubled. **What** is the effect of this on the distance moved by the water drop during the same period (t)?
 - (c) From your observations, **explain why** aquatic plants are abundant in the surficial layer of seawater?
- 11 **What** is the impact of Gulf stream on both climate and biodiversity in marine environment?



Questions ?

Unit 1 | Lesson 9

Answered

Effect of Water Pressure on Organisms

Interactive test



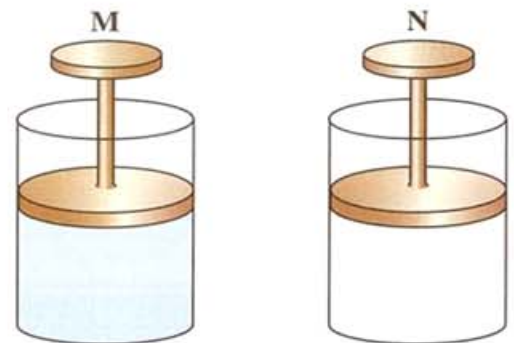
First

Multiple Choice Questions

Questions signed by * are answered in detail.

The pressure at a point inside a static liquid

- 1 The opposite figure represents two movable pistons, piston M enclosing an amount of liquid and piston N enclosing an amount of gas, so when putting a mass of 5 kg on each of the two pistons, which piston will move downward?



- (a) Piston M only. (b) Piston N only.
(c) Both pistons. (d) Both pistons don't move.

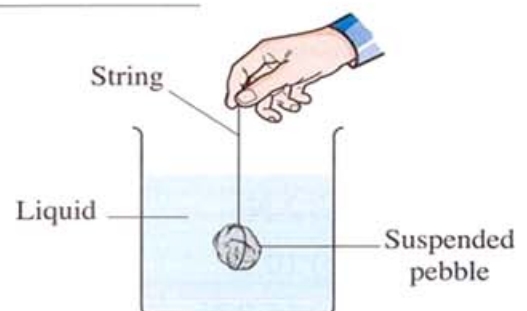
- 2 Any point inside a liquid is affected by a pressure that equals of the liquid column above a unit area surrounding this point.

- (a) the density (b) the volume (c) the weight (d) the mass

- 3 Which of the following doesn't represent a measuring unit of pressure?

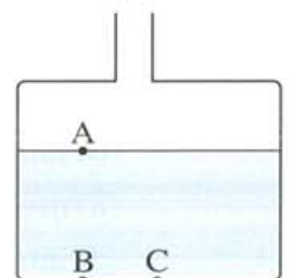
- (a) N/m^2 (b) atm (c) J (d) Pa

- 4 The opposite figure represents a pebble suspended to a string and submerged under a liquid surface, which of the following actions will cause an increase in the pressure on the pebble?



- (a) Polishing the surface of the pebble.
(b) Raising the pebble slightly upward.
(c) Dropping the pebble in the bottom of the beaker.
(d) Submerging the pebble to the same depth in a liquid of lower density.

- 5 The opposite figure shows three points A, B and C in a glass tank that contains an amount of water which is exposed to atmospheric pressure, so the correct order of pressure values at the three points is

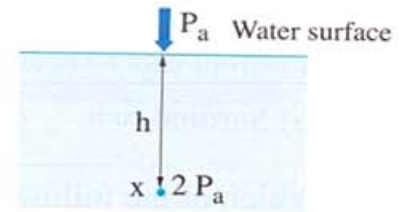


- (a) $P_A > P_B = P_C$ (b) $P_A > P_B > P_C$
(c) $P_A < P_B < P_C$ (d) $P_A < P_B = P_C$

- 6 Three metal slides (X), (Y) and (Z) with areas A , $2A$ and $2A$ are placed in a liquid with density (ρ) at depths of h , h and $1.5h$ respectively, the correct arrangement of the three slides in terms of the force acting on them as a result of the fluid pressure is
- (a) $(X) = (Y) = (Z)$ (b) $(X) < (Y) = (Z)$
 (c) $(X) < (Y) < (Z)$ (d) $(X) = (Y) < (Z)$
- 7 $1.013 \text{ Pascal} = \dots\dots\dots \text{ atm}$
 (a) 10^4 (b) 10^{-4} (c) 10^5 (d) 10^{-5}
- 8 If you know that the pressure at a point inside a liquid is $2 \times 10^5 \text{ N/m}^2$, then it is equivalent to atm
 (a) 0.506 (b) 1.974 (c) 2.026 (d) 2.243
- 9 When a salmon fish migrates from ocean to river, the pressure on its body at the same depth
 (a) decreases (b) increases (c) doesn't change (d) can't be determined

The effect of pressure on the biological adaptations of aquatic organisms

- 10 * In the opposite figure, if the total pressure at point (x) at depth (h) in ocean water is double the atmospheric pressure at water surface, so at depth ($3h$) from the surface of ocean water, the total pressure is

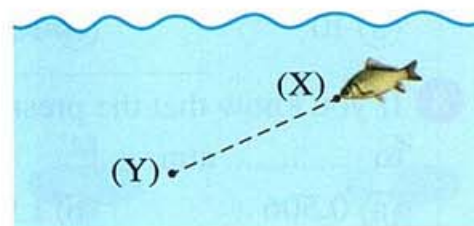


- (a) $3 P_a$ (b) $4 P_a$
 (c) $5 P_a$ (d) $6 P_a$
- 11 The water pressure increases by about per each 10 m of depth beneath the water surface.
 (a) 1 atm (b) 10 atm (c) 1 Pa (d) 10 Pa
- 12 If the depth of water in a lake is 40 m, then the pressure caused by the water at the bottom is about
 (a) three times the atmospheric pressure (b) four times the atmospheric pressure
 (c) five times the atmospheric pressure (d) six times the atmospheric pressure
- 13 The organisms that have less strong body structure compared to other organisms are used to live in
 (a) surface water of ocean (b) intermediate-depths water of ocean
 (c) deep depths water of ocean (d) intermediate and deep depths water of ocean
- 14 The organisms that live at great depths in oceans are characterized by the absence of air bladder such as
 (a) sardine fish (b) tilapia fish (c) ray fish (d) salmon fish

15 What is the main function of swim bladder in fish that live at intermediate depths?

- (a) Maintaining the temperature of their body.
- (b) Help in digestion.
- (c) Control their buoyancy.
- (d) Storage oxygen for breathing.

16 The opposite figure shows tilapia fish during swimming from point (X) to point (Y).
So,



	Pressure exerted on it	Air bladder volume
(a)	decreases	decreases
(b)	decreases	increases
(c)	increases	decreases
(d)	increases	increases

17 Which of the following fish used to live in deep depths and depend on their large liver that is rich in oils to bear high pressure?

- (a) Sardine fish.
- (b) Salmon fish.
- (c) Ray fish.
- (d) Tilapia fish.

18 Which of the following fish are characterized by having bony skeleton that represents the main support of the fish body?

- (a) Ray fish and shark.
- (b) Ray fish and tilapia fish.
- (c) Tilapia fish and mullet fish.
- (d) Mullet fish and shark.

19 Which of the following is correct about ray fish?

- (a) Its body contains bony skeleton.
- (b) Its body contains air bladder.
- (c) Its body contains light and flexible cartilaginous skeleton.
- (d) It mostly exists in the surface layer of ocean water.

Second Miscellaneous Questions

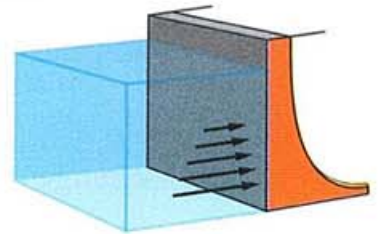
1 Write the scientific term for each of the following statements:

- (a) The weight of a liquid column per unit area whose height is from a certain point inside the liquid to its surface.
- (b) An organ exists in some fish which is filled with gases to allow them to control their depth in water.

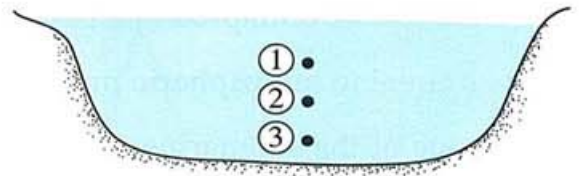
2 Give reasons for:

- (a) The water pressure at a point inside the water increases with increasing the water depth at that point.
- (b) The physical structure of organisms that live near the surface of the water is less strong compared to organisms that live in the depths.
- (c) Ray fish doesn't have air bladder.
- (d) Ray fish has a large liver filled with oils.

3 Dams are designed to be thicker at the bottom as shown in the opposite figure. Explain this.



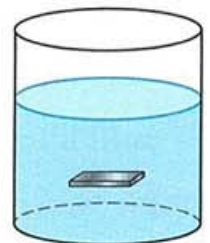
4 The opposite figure illustrates three points ①, ②, ③ at different depths beneath the water surface, arrange these points according to the water pressure exerted on each point.



5 What is the role of gas bladder in salmon fish?

6 The deep-sea fish have high ability to adapt with the high water pressure. Explain.

7 The opposite figure shows a slide of surface area 20 cm^2 located inside a liquid and being subjected to a pressure of $1.028 \times 10^5 \text{ N/m}^2$. Calculate the total force acting on the slide.



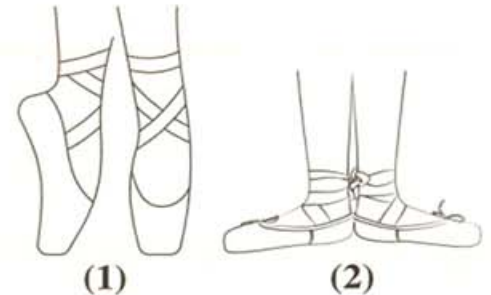
8 What is the advantage of the presence of a cartilaginous skeleton in sharks that live in deep depths?

9 How do deep-sea fish adapt to high pressure with respect to the structure of their cellular membranes?

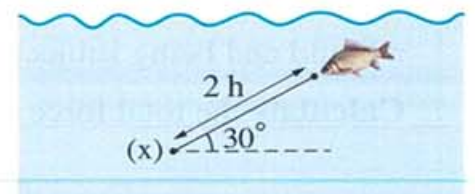
10 Fish tank whose base area is 640 cm^2 containing water of weight 1280 N . What is the value of water pressure on the bottom of the tank in pascal?

Choose the correct answer from the given answers:

- 1 When a ballet player changes the position of her feet from position (1) to position (2) as shown in the opposite figure, the pressure exerted by the player on the ground



- (a) increases
(b) decreases
(c) doesn't change
(d) the answer can't be determined
- 2 A submarine collapsed at a depth of 4000 m below the sea surface, if the pressure inside it was equal to atmospheric pressure, then the difference in pressure between the inside and outside of the submarine at that depth was
- (a) 25 atm
(b) 125 atm
(c) 369 atm
(d) 400 atm
- 3 If the water pressure on a fish at a depth of (h) from the water surface is (P), so if the fish moves a distance of (2 h) until it reaches the point (x) as shown in the figure, then the water pressure on the fish increases by



- (a) 0.5 P
(b) P
(c) 2 P
(d) 3 P

كيفية طباعة صفحات معينة من ملف معين

مثلا ازاي نطبع الصفحات من صفحة 4 الى صفحة 9



حمل الآن

مجاناً وحصرياً

المراجعة رقم (2)

اختبار شهر نوفمبر



Unit(1) - lesson (6)

Biological adaptations of living organisms in the aquatic environment

Adaptation: It is the behavioral or physical traits of the living organism that enable it to survive in its ecosystem

N.B In aquatic environments, whether in deep oceans or shallow lakes, every organism has a set of adaptations that help it reproduce and survive according to different conditions such as changes in temperature, high salinity,

The types of adaptations in aquatic living organisms



First: Structural Adaptations

First: Structural Adaptation First: It is the changes in the structure and the of some parts of living organism that help it to survive in its environment.

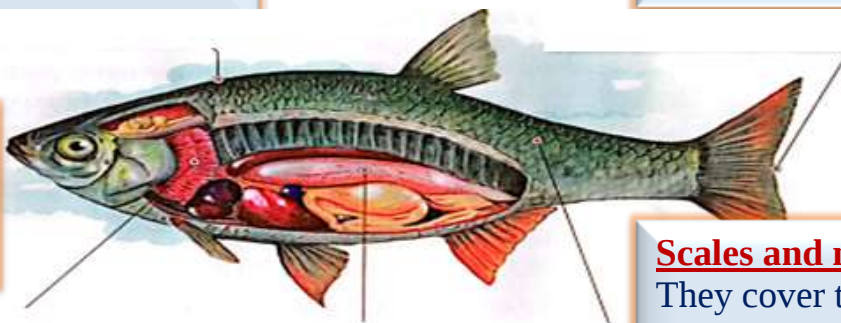
1-The general structural adaptations of fish

The streamlined body It reduces the water resistance against fish movement

Fins They are the movement organs of fish in water

Mucus to make it waterproof and reduce water

Gills They enable fish to extract the dissolved oxygen in water



Air bladder (Swim bladder) It helps the bony fish to float on water

Scales and mucus They cover the body of the fish to be waterproof and to reduce the water resistance to its movement while swimming



2- The structural adaptations of deep-ocean fish

their bodies are compressed to withstand the very high pressure in deep water



Big eyes To be able to see in the dark



N.B Ice-fish is considered as an example for a compressed deep-sea fish which lives in the cold southern oceans, at depths of up to 2,000 meters.

3-Structural adaptation of dolphins

Dolphins are mammals, but they differ structurally from mammals that live on land.as :-

- 1-They have a streamlined shape
- 2- Fins instead of legs to help them swim,
- 3-They have breathing holes on the top of their heads instead of noses, allowing them to breathe atmospheric air.



Second Behavioral adaptations

It is the adjustment of living organisms through certain actions or behaviors whether

- 1- Inherited behaviors
 - 2- acquired behaviors
- that help organisms face the harsh conditions or to better utilize the available resources



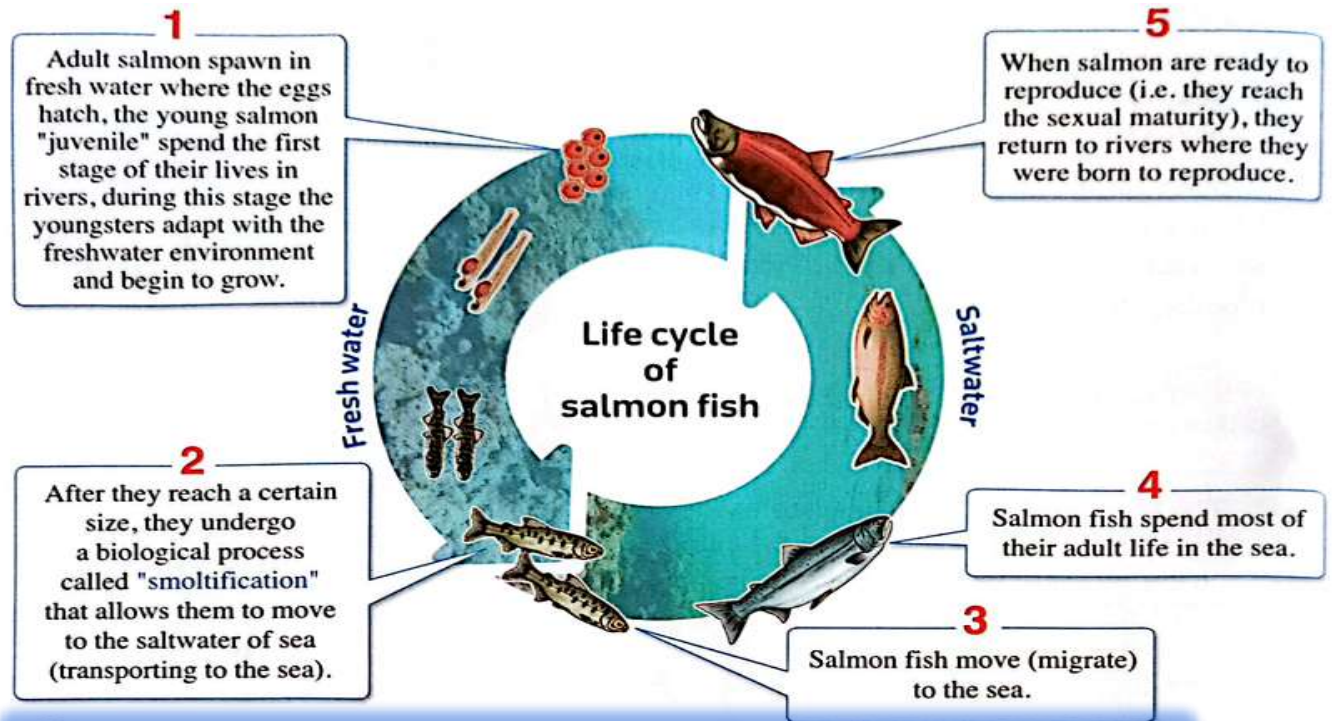
For examples,

1-Whales make sounds that allow them to communicate and catch their prey,
2-Salmon fish migrate between fresh-water and salt-water to reproduce and survive as following :-

a- When salmon eggs hatch, their juvenile (young salmon) spend the first period of their lives in freshwater and adapt to the freshwater environment.



- b-After reaching certain age salmon fish migrate to the sea, where they spend most of their adult life.
- c- When the salmon reach sexual maturity, they begin to return to the rivers in which they were born to reproduce.



Third :Physiological (Functional) adaptations

It is the modification in the way that some body organs of a living organism perform their biological (vital) functions that enable the living organism to survive in their environments.

1- low oxygen

Adaptation of some fish that live in the depths of the oceans for low oxygen

They have special abilities to regulate respiration as they can slow their metabolism to reduce their oxygen needs.

2-high pressure

some fish that live in the depths of the oceans for high pressure

-They also have the ability to effectively regulate blood pressure, to remain unaware of the high pressure on it,

- The presence of strong and durable arteries and veins that can withstand the pressure.



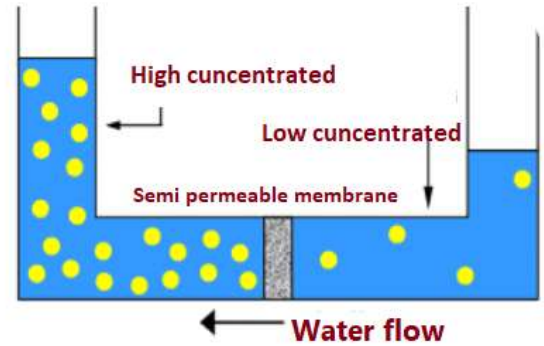
A famous example of structural and physiological adaptations in deep-sea fish is the **viper fish**, which is found in tropical regions of the major oceans and

It is characterized by

- a- the flexibility of its skeleton to withstand the high pressure at depths.
- b- It also has high concentrations of hemoglobin in its blood to adapt to the low oxygen levels at depths



N.B 1-The high concentrated solution has a higher osmotic pressure than a low concentrated solution, so water moves from the less concentrated solution to high concentrated solution
2-The osmotic pressure of aquatic organisms differs from that of their surrounding environment, whether freshwater or saltwater, so these organisms adapt to the difference in osmotic pressure.



A-Physiological adaptation of freshwater organisms to low osmotic pressure

Due to the osmotic pressure of fresh water is low in compare to that of the body fluids in these organisms, a large amounts of water withdraw to their bodies .

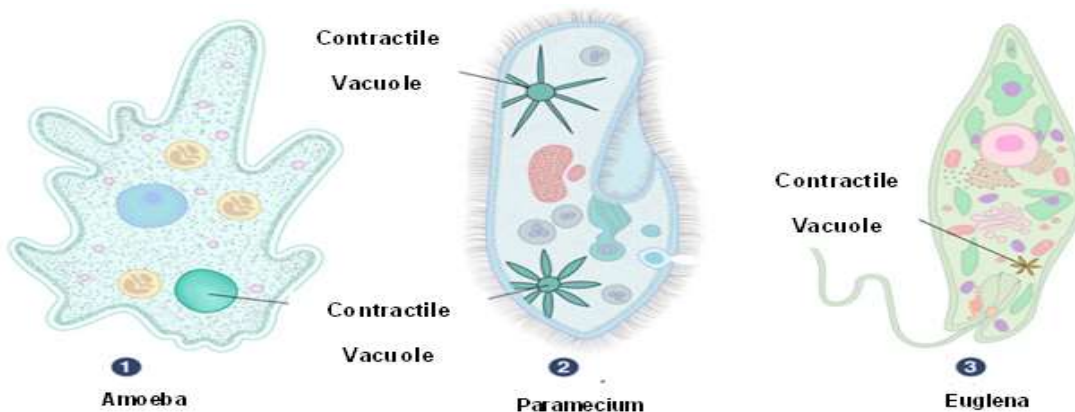
They get rid of the excess water to protect their bodies from bursting and death

Examples

In unicellular organisms

-As Amoeba, Paramecium, and Euglena, they have a structure or a cellular organelle called a "contractile vacuole"

Function of the contractile vacuole: collecting the excess water in the cell, and when it is filled with water, it moves towards the cell membrane, where it discharges its water content to the outside of the cell





In multicellular organisms,
such as fish that live in fresh water
They eliminate the excess water that
enters the body through The two kidneys
in the form of diluted urine



B. The physiological adaptation of saltwater organisms to high osmotic water pressure

Fish that live in saltwater: need to swallow large amounts of seawater to compensate for the loss of water, then they excrete the excess salts via their kidneys and specialized cells in their gills

Example of fish that adapts physiologically to the high salinity of water in oceans and seas is Shark fish



In order to maintain the water and salt balance inside its body, it uses a specific mechanism to control the level of urea in its blood, as follows

It keeps high levels of urea in its blood



The high level of urea increases the osmotic pressure of the blood to become nearly equal to the osmotic pressure of the surrounding water



So, this helps in decreasing the water loss from its body to the high salinity surrounding environment

Urea is a nitrogenous compound produced from the catabolism of protein inside the living organism's body, such as mammals (like humans), and it is expelled from the body with urine

Activity

Search the internet to find the biological adaptations found in the lionfish and the colorful octopus



Colorful octopus



Lion fish



Chapter One (I) Lesson (6)

First: Choose the correct answer

1-What does the structural adaptation mean

- The change in the activity of the living organism to adapt to its environment
- The change in the action mechanism of some living organism's body organs to adapt to its environment
- The change in the physical structure of the living organism to help it survive in its environment
- The change in the diet of the living organism

2-What is the structural adaptation that allows the following fish to live in complete darkness



- The presence of big eyes
- The presence of skin that reflects light
- The presence of light organs on the body
- The presence of sharp fins

3-Which of the following is considered a structural adaptation for some ocean fish to withstand very high pressure

- Fine blood capillaries
- Compressed bodies
- Mucus that covers the body
- Large gills

4-How does the structural adaptation help the deep-water fish adapt to low oxygen in the deep sea

- The presence of compressed bodies
- The presence of light organs on the body
- The presence of large fins
- The presence of fine blood capillaries

5-Which of the following structural adaptations help fish to swim effectively

- Large fins and the streamlined body
- Big eyes and air bladder
- Wide mouth and swim bladder
- Transparent skin and specialized gills

6-How does the presence of gills in fish help them adapt to its aquatic environment

- They allow the extraction of dissolved oxygen in water
- They help regulate body temperature
- They act as a foraging tool for food
- They help seeing underwater

7-Which of the following is a similarity between Amoeba and fish

- Cellular respiration
- The number of body cells
- The gas exchange organ
- The methods of osmoregulation

8-Which of the following help(s) in reducing the water resistance to the movement of fish in water

- Scales only
- Mucus only
- Mucus and streamlined body only
- Streamlined body, mucus, and scales

9-The ability of Bolti (tilapia) fish to rise to the water surface occurs due to the presence of



- a. fins b. gills c. air bladder d. compressed body

10-Which of the following doesn't characterize the deep oceans fish

- a. Compressed body b. The presence of contractile vacuole
c. The presence of fine blood capillaries d. The presence of strong arteries

11-Which of the following aquatic environments is the best for salmon fish reproduction

- a. Seas b. Salty lakes c. Oceans d. Rivers

12-What is the main behavioral adaptation of salmon fish during their life cycle

- a. Changing the skin color b. Migrating from the river to the sea, then returning back
c. Living in ocean only d. Living in rivers only

13-Which of the following is an example for the behavioral adaptation

- a. The daily migration of some fish species b. The venomous spines in the lionfish
c. Venom secretion in some types of eels d. The very fine blood capillaries of the electric eel

14-What is the process that helps in the transfer of salmon fish from living in fresh water to saltwater

- a. Osmotic pressure b. Sexual maturity c. Smoltification d. Reproduction

15- Which of the following diagrammatic figures represents the life cycle of salmon fish



16-Which of the following is correct about salmon fish

- a. Physiological adaptations depend on behavioral adaptations
b. Behavioral adaptations depend on physiological adaptations
c. There is no relationship between the physiological and behavioral adaptations
d. Each of the physiological and behavioral adaptations depends on the other

17-What is the reason for the returning back of the salmon fish that are illustrated in the opposite figure to the place where the eggs hatch again

- a. For nutrition
b. For escaping from enemies
c. For reproduction
d. For protection from the climate change



18-What is the vital phenomenon that helps the salmon fish adapt to the change of the aquatic environment from sea to river

- a. The ability to control their body temperature
b. The ability to change their diet
c. The ability to modify the level of salt in their bodies
d. The ability to increase the size of their heart





19-What does the physiological adaptation mean

- Changing the environmental conditions to be suitable for the organisms that live there.
- The suitability of the organism to the conditions of the environment where it lives.
- The suitability of chemical and physical properties in the environment.
- The biodiversity in the environment takes place to maintain its balance.

20-Which of the following expresses the physiological adaptation of the living organism?

- A modification in the physical structure of the organism to be suitable with its environmental conditions.
- A modification in the behavior of the living organism to be suitable with its environmental conditions.
- The migration of the living organism from its environment to reproduce.
- A modification in the living organism's action to perform some vital functions.

21-How does the Viper fish adapt to oxygen deficiency to survive in deep water?

- By increasing the gills' ability to extract oxygen.
- By converting to a new diet.
- By increasing the cellular respiration rate
- By containing high concentration of hemoglobin in blood

22-Which of the following is considered a physiological change in the oceanic fish

- | | |
|-----------------------------------|----------------------|
| a. The compressed body | b. Strong arteries |
| c. The increase in blood pressure | d. Large-sized gills |

23- Which of the following adaptations enables the deep-water fish to live with low oxygen

- | | |
|--|-----------------------------|
| a. Slowing down the metabolism rate | b. The compressed body |
| c. The increase of salt concentration in cells | d. The strong blood vessels |

24-Which of the following expresses correctly the physiological adaptation of a living organism

- | | |
|---|---|
| a. Modifying its behavior | b. Changing the structure of some of its organs |
| c. The absence of some unnecessary structures | d. Increasing the efficiency of respiration |

25-Which of the following cases has the highest osmotic pressure

- | | |
|---------------------------------------|--------------------------------------|
| a. Low-concentrated solution | b. High-concentrated solution |
| c. Pure solvent with high temperature | d. Pure solvent with low temperature |

26-During the osmosis experiment, the semi-permeable membrane acts on

- allowing the passage of solutes only
- allowing the passage of water only
- allowing the passage of large-sized substances
- preventing the passage of all substances

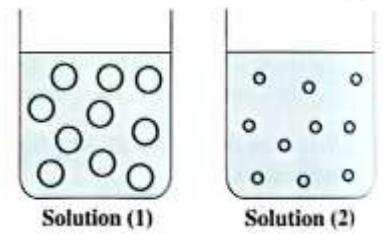
27-When water passes from a solution in region (X) to a solution in region (Y), this means that

- The concentration of water in the solution of region (X) is higher than that in the solution of region (Y)
- The concentration of solution in region (X) is higher than that of the solution in region (Y)
- The concentration of water in the solution of region (Y) is higher than that in the solution of region (X)
- The concentrations of the solutions in both regions (X) and (Y) are equal



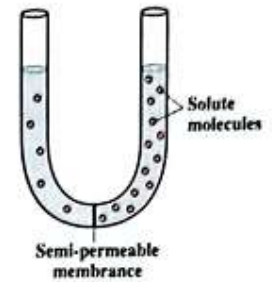
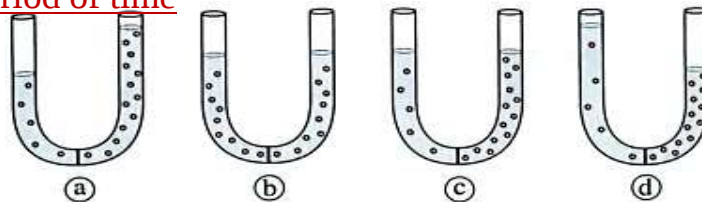


28-The opposite figures illustrate an identical number of animal cells after putting them in two solutions with different concentrations (1) and (2), where the cells in solution (2) represent the size of cells in normal condition. In the light of studying the osmosis phenomenon, what could you conclude from these figures?

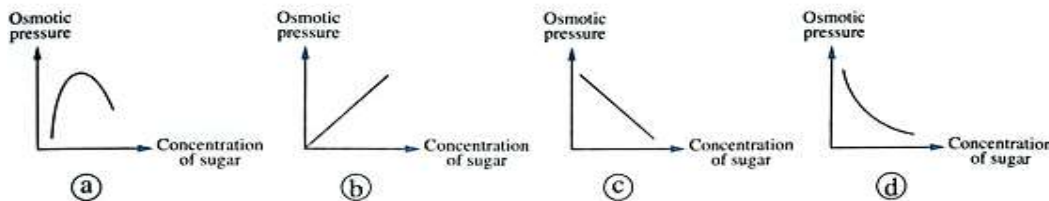


- The concentration of solute in solution (1) is higher than that inside the cell
- The concentration of solute in solution (2) is higher than that inside the cell
- The concentration of solvent in the two solutions is equal
- The concentration of solvent in solution (1) is higher than that inside the cell

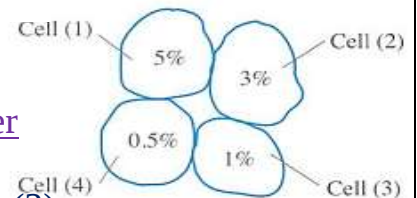
29From the opposite figure and according to the osmosis phenomenon, which of the following represents the shape of a tube after a period of time



30-Which of the following graphs illustrates the relationship between the concentration of sugar in a sugar solution and its osmotic pressure



31-The opposite figure represents 4 cells that contain different concentrations of sugar.



(1)Which of the following represents the movement of water transfer through cells by osmotic pheromone

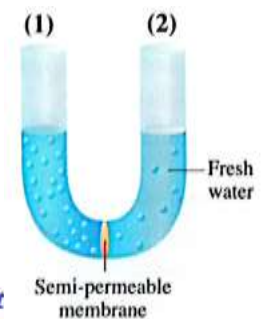
- Cell no. (1) to cell no. (2)
- Cell no. (2) to cell no. (3)
- Cell no. (3) to cell no. (4)
- Cell no. (4) to cell no. (1)

(2)If these cells are put in a solution whose concentration is 10%, what do you expect to happen to these cells

- The size of the cells isn't affected
- All cells swell
- Only cells (1) and (2) shrink
- All cells shrink

32-From the opposite figure, in the light of the osmosis phenomenon, which of the following is correct after passing a period of time

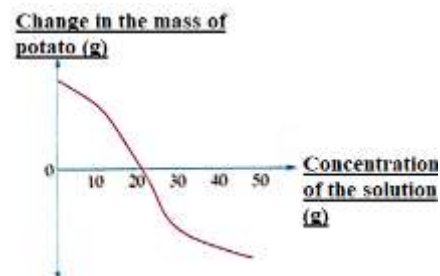
- The molecules of solvent transfer from (1) to (2)
- The molecules of solvent transfer from (2) to (1)
- The molecules of solute transfer from (1) to (2)



d. The molecules of solute transfer from (2) to (1)

33- The opposite graph illustrates the results of an experiment, where a group of potato slices with equal masses was placed in several saline solutions with different concentrations, at which concentration the mass of the potato slice doesn't change

- a. 10 g/L b. 20 g/L
c. 30 g/L d. 40 g/L



34- The osmotic pressure leads to the diffusion of water from the solution that is characterized by

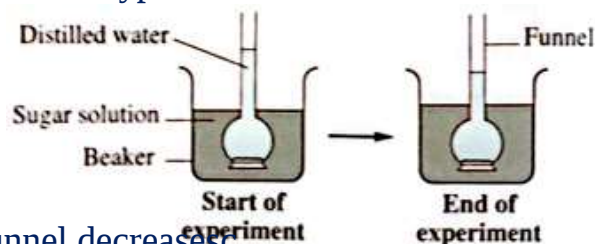
- a. having high osmotic pressure
b. having a high concentration of salts
c. having low osmotic pressure
d. having a low concentration of water molecules

35-What is the main factor that affects the solution osmotic pressure inside the cell?

- a. Temperature b. Type of membrane
c. The concentration of the dissolved substances d. Type of the dissolved substance

36-The opposite figure illustrates an experiment for studying the osmosis phenomenon. Which of the following is correct

- a. Water transfers from the beaker to the funnel
b. Water transfers from the funnel to the beaker
c. The osmotic pressure of the solution inside the funnel decreases.
d. The osmotic pressure of the solution inside the beaker increases



37-Which of the following represent(s) the excretion mean in Amoeba

- a. Cell membrane b. Gills c. Mitochondria d. Contractile vacuole

38-Which of the following organs has/have a major role in getting rid of excess water in the freshwater fish

- a. Skin b. Mouth c. Gills d. Kidneys

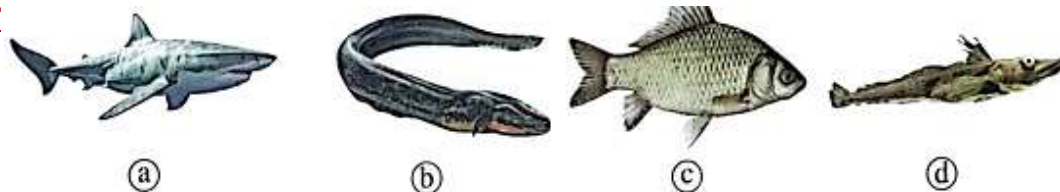
39-Which of the following types of water has a higher osmotic pressure than that of the body fluids inside the living organisms that live in this water

- a. Oceans water b. Rivers water c. Springs water d. Freshwater ponds

40-The ratio between the osmotic pressure of fresh water to the osmotic pressure of the body fluids inside the living organisms' bodies that live in this water is

- a. greater than 1 b. smaller than 1 c. equal to 1 d. equal to zero

41-Which of the following organisms has the ability to adapt to the low osmotic pressure of fresh water





42-What is the chemical substance that the shark fish keep in their blood to help in the regulation of its osmotic pressure

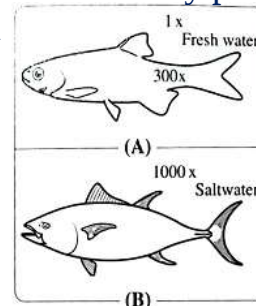
- a. Water b. Oxygen c. Urea d. Carbon

43-The kidneys in freshwater are different from the kidneys on saltwater fish

- a. their location in the body b. the concentrate of urine that they produce
c. the type of fluid that they produce d. their mechanism of action

44-The opposite figures illustrate two types of fish

(A) and (B), if the osmotic pressure of fresh water is (x) and the osmotic pressure of the fluid inside the cells of fish (A) is 300x, answer



1-Fish (B) is characterized from fish (A) by all of the following, except that

- a. the osmotic pressure of its cells is higher than that of the medium where it is present
b. the osmotic pressure of its cells is lower than that of the medium where it is present
c. the rate of urine excretion is lower
d. the concentration of salts in urine is higher

2-What do you expect about the value of the osmotic pressure of fish (B)

- a. Between x: 300x b. Between 350x: 1000x
c. Lower than x d. Higher than 1000x

45-Which of the following is considered a means for aquatic living organisms to get rid of excess water

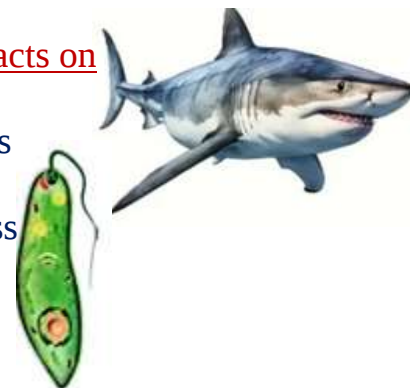
- a. The kidneys only b. The cellular respiration only
c. The contractile vacuoles or kidneys d. Skin and gills

46-The increase in the urea level inside the opposite fish body acts on

- a. Increasing the osmotic pressure and the water loss
b. Increasing the osmotic pressure and decreasing the water loss
c. Decreasing the osmotic pressure and water loss
d. Decreasing the osmotic pressure and increasing the water loss

47-The opposite organism is characterized by.....

- a. Being unicellular and lives in a salty environment
b. Having a higher osmotic pressure inside its contractile vacuole than that of its medium
c. Having a lower osmotic pressure inside its contractile vacuole than that of its medium
d. Having a contractile vacuole to get rid of salts only



48-Which of the following will burst when placed for a period of time in distilled water

- a. Amoeba b. Paramecium c. Euglena d. Red blood cell

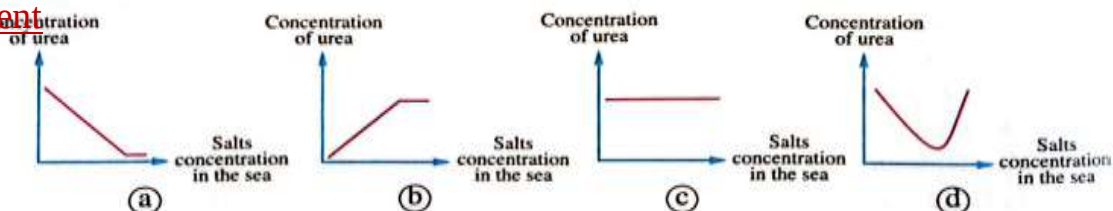
49-Which of the following is considered a similarity between Paramecium and Nile tilapia (bolti) fish

- a. The presence of contractile vacuole b. The degree of evolution
c. The ability to get rid of the excess water c. The method of getting rid of the excess water





50-Which of the following graphs illustrates the relationship between the concentration of salts in seawater where sharks live and the concentration of urea in their blood to adapt to their environment



51-The adaptation of salmon fish during their life cycle is considered

- a. Physiological and behavioral adaptations
- b. Behavioral adaptation only
- c. Physiological and structural adaptations
- d. Structural adaptation only

52-All of the following are considered a reason for performing the behavioral adaptation by living organisms, except

- a. avoiding the hardships
- b. better use of the available resources
- c. completing the reproduction process
- d. being able to breathe





Theme: (1) – chapter (1) - lesson (7)

The effect of atmospheric gases on aquatic environments

Oxygen and Carbon dioxide in Aquatic Environment

Rivers and seas naturally contain sufficient levels of oxygen and carbon dioxide to keep aquatic life of plants, fish, and microorganisms such as bacteria and algae

First: Oxygen

A-Sources of oxygen in aquatic environment:

1. The main source of oxygen in water is atmospheric air, where oxygen Slightly soluble in water

2. In seas and oceans, more oxygen dissolves in water (Why) (G.R.?)

Due to waves and water currents in the ocean, which increase the rate of gas exchange between the atmosphere and water



3. phytoplankton, algae, and aquatic plants produce oxygen in water in the process of photosynthesis

Therefore, aquatic plants, algae, and phytoplankton play a key role in producing the energy required for aquatic organisms by carrying out photosynthesis, during which they absorb carbon dioxide and release oxygen (the main source of energy for life in water), thus providing food and oxygen through this vital process



"Dissolved oxygen in water plays an essential role in providing the energy required for marine organisms to carry out various vital processes.

This occurs through the oxidation of glucose molecules Percentage of gas

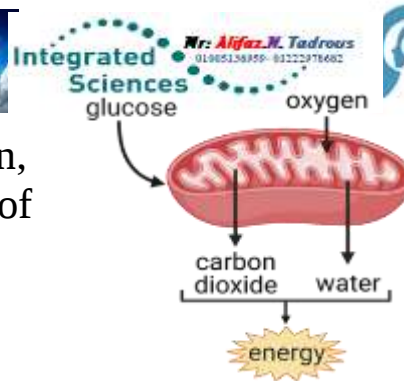
$$\text{Solubility} = \frac{\text{volume of solution}}{\text{Percentage of gas}}$$





the primary source of energy during cellular respiration, a process known as catabolism, which constitutes one of the two major pathways of metabolism."

Solubility affected by 1-temperature 2-Pressure
3-Nature of substances



Second: Carbon dioxide

A-Sources of carbon dioxide in aquatic environment:

1. The atmosphere is the main source of carbon dioxide (CO_2) in water, where carbon dioxide is exchanged between the atmosphere and water

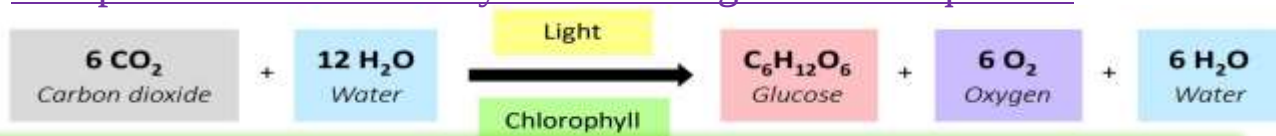
2. Marine organisms produce carbon dioxide gas that dissolves in the surrounding water as a waste product of their metabolism

3. Human activities such as

- The industrial pollution
- The decomposition of organic matter carried by agricultural wastewater

Most aquatic organisms depend on CO_2 dissolved in water, which is absorbed by aquatic plants and algae during photosynthesis to build organic matter such as carbohydrates.

This process is illustrated by the following chemical equation:



2-Solubility of oxygen and carbon dioxide in water:

Solubility is the ability of a solute to dissolve in a solvent to form a homogeneous solution at a specific temperature and pressure, or it is the maximum amount of solute required to form a saturated solution at constant temperature and pressure.

Solubility is influenced by several factors such as temperature, pressure, and the nature of the substance

$$\text{Solubility} = \frac{\text{Mass of solute}}{\text{Volume of solution}}$$

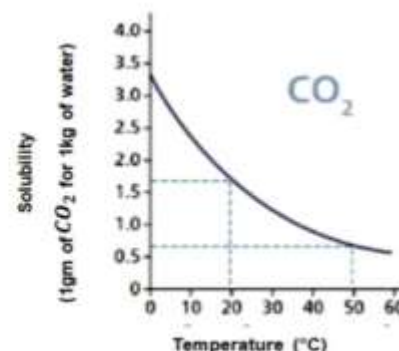
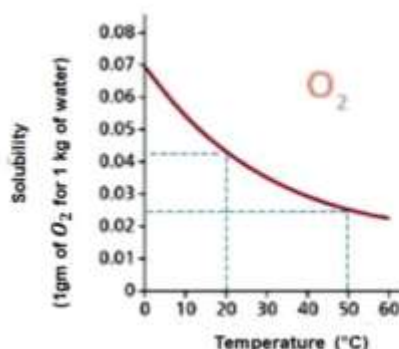
$$\text{Solubility} = \frac{\text{volume of solution}}{\text{Percentage of gas}}$$

1. The concentration of oxygen gas in the air is about 500 times higher than that of carbon dioxide

2. Oxygen gas is about 50 times less soluble in water than carbon dioxide

3. The solubility of the two gases in salty ocean water is about 20-30% lower than their solubility in fresh water

In general, the solubility of the two gases decreases at higher temperatures. As the temperature increases, the percentage of CO₂ dissolved in water decreases, but at a greater rate than the percentage of oxygen in water as shown in the following graph



The effect of increasing the percentage of dissolved oxygen in water:

1. Enhancernent (improving) of respiration

Aquatic organisms depend on dissolved oxygen in water for respiration

Increasing the amount of oxygen in water improves their ability to breathe



2. Improved metabolism:

High levels of dissolved oxygen can support the metabolism of aquatic organisms and improve the growth

3. Increased activity:

Adequate levels of dissolved oxygen, stimulate aquatic organisms to be more active in swimming, hunting, and reproduction

4. Maintain balance of the ecosystem:

A healthy level of dissolved oxygen in water is critical in maintaining a stable aquatic ecosystem by supporting diverse populations of fish, invertebrates, and plants



The effect of increased CO₂ in water on aquatic organisms:

Increased CO₂ in water can have several negative effects on aquatic organisms, including:

1. Acidification:

When CO₂ levels are high in the atmosphere it can dissolve in greater amounts in water, **leading** to an increase in carbonic acid (H₂CO₃) and a **decrease** in the pH value of the water

This acidification can be harmful to many species of aquatic organisms, specially those in sensitive life stages such as the egg and larval stages

2. Weak respiration:

High levels of carbon dioxide can reduce the amount of dissolved oxygen in the water necessary for aquatic organisms to breathe

3. Weakness of the support

Support in living organisms is divided into two types:

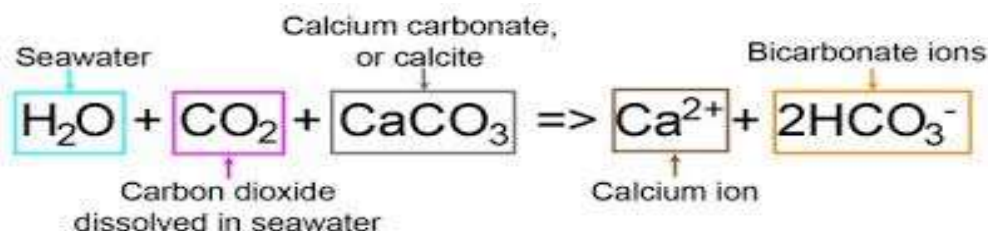
A - The external support

which forms the exoskeleton of living organisms such as coral, a mollusk and sea urchins. This support provides support and stability for the animal's body, and these organisms depend on the process of calcification



Reduced calcification:

Many marine organisms such as corals, mollusks, and some species of plankton depend on calcium carbonate to form their shells or skeletons. Increased CO₂ converts calcium carbonate into calcium bicarbonate which dissolves in water, disrupting the ability of these organisms to build or maintain their skeletons



(b) The internal support

Which forms the internal skeleton of aquatic organisms such as fish and marine mammals such as dolphins and whales.

The endoskeleton may be bony and composed primarily of calcium phosphate in addition to the protein collagen, as in bony fish, such as tilapia and prawns.

An increase in carbon dioxide affects the calcium balance in the bodies of fish, impairing their growth.

The effect of CO₂ deficiency in water on aquatic organisms:

1. Reduced photosynthesis:

Aquatic plants and algae need carbon dioxide for photosynthesis.

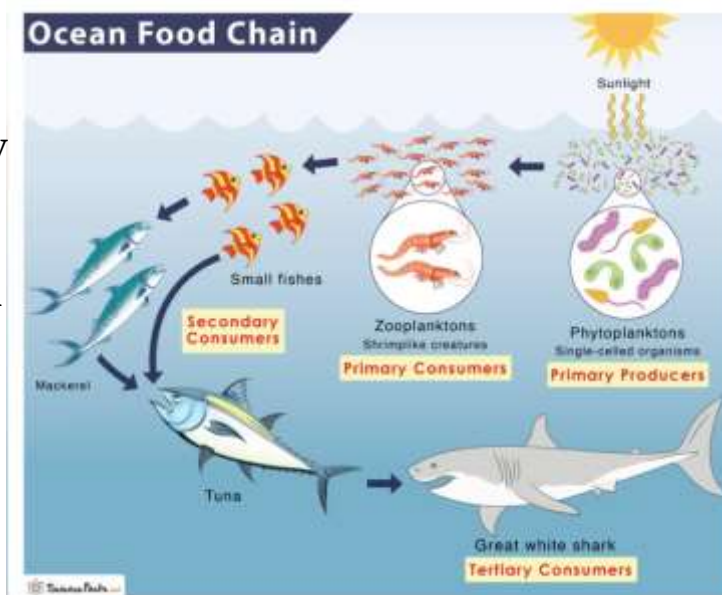
Decreasing the availability of CO₂, in water may limit their ability to produce energy, affecting the overall productivity of the ecosystem

2. Effects on food chains:

A change in the level of CO₂, in the water can affect productive organisms such as phytoplankton and algae, thereby affecting organisms at higher levels of the food chain

3. Disruption of pH

Low concentrations of CO₂, may lead to an increase in the pH of water, negatively affecting sensitive species that are adapted to a certain pH range





Chapter One (I) Lesson (7)

Part (A) – Choose the correct answer

1. The main source of oxygen in aquatic environments is:
 - a) Respiration of fish
 - b) Atmospheric air
 - c) Industrial activities
 - d) Decomposition of organisms
2. Oxygen dissolves more in seas and oceans because of:
 - a) High temperature
 - b) Salt concentration
 - c) Waves and water currents
 - d) Sunlight
3. The main producers of oxygen in water are:
 - a) Whales and dolphins
 - b) Phytoplankton, algae, and aquatic plants
 - c) Mollusks and corals
 - d) Bacteria only
4. The process by which aquatic plants release oxygen is:
 - a) Respiration
 - b) Photosynthesis
 - c) Fermentation
 - d) Calcification
5. Oxygen in water is mainly used by organisms for:
 - a) Digestion
 - b) Circulation
 - c) Respiration
 - d) Reproduction
6. Dissolved oxygen in water provides energy through:
 - a) Photosynthesis
 - b) Oxidation of glucose
 - c) Decomposition of wastes
 - d) Nitrogen fixation
7. The main source of carbon dioxide in water is:
 - a) Photosynthesis
 - b) Atmosphere
 - c) Sea currents
 - d) Waves
8. Carbon dioxide is released in water as a waste product of:
 - a) Photosynthesis
 - b) Respiration of marine organisms
 - c) Calcification
 - d) Sunlight exposure
9. Human activity that increases CO₂ in water is:
 - a) Fishing
 - b) Industrial pollution





- c) Swimming
- d) Boating
10. Aquatic plants use dissolved CO_2 in:
 - a) Respiration
 - b) Photosynthesis
 - c) Calcification
 - d) Decomposition
11. Solubility is defined as:
 - a) Mass of solution $\div$ volume of solute
 - b) Ability of solute to dissolve in a solvent at given T and P
 - c) The weight of a gas in water
 - d) Maximum temperature of dissolution
12. Solubility of O_2 compared to CO_2 in water is:
 - a) Equal
 - b) 50 times higher
 - c) 50 times lower
 - d) 500 times higher
13. Solubility of gases in salty water compared to fresh water is:
 - a) Higher by 20–30%
 - b) Lower by 20–30%
 - c) Equal
 - d) Depends only on temperature
14. Solubility of gases in water generally:
 - a) Increases with temperature rise
 - b) Decreases with temperature rise
 - c) Remains constant
 - d) Not affected by temperature
15. Which gas decreases faster with rising temperature?
 - a) Oxygen
 - b) Carbon dioxide
 - c) Nitrogen
 - d) Both O_2 and CO_2 equally
16. Increasing dissolved oxygen in water leads to:
 - a) Weak respiration
 - b) Ecosystem imbalance
 - c) Improved respiration
 - d) Calcification reduction
17. High dissolved oxygen improves:
 - a) Photosynthesis only
 - b) Metabolism and growth
 - c) Acidification
 - d) Decomposition
18. Adequate oxygen stimulates aquatic organisms to:
 - a) Sleep more
 - b) Be more active in swimming and reproduction
 - c) Stop moving
 - d) Die quickly





19. Maintaining ecosystem balance in water requires:
- High carbon dioxide
 - Adequate oxygen
 - Salt crystals
 - High temperature
20. Increased CO₂ in water causes:
- Photosynthesis increase
 - Water alkalinity
 - Acidification
 - Higher pH
21. Acidification is caused by formation of:
- Oxygen gas
 - Carbonic acid (H₂CO₃)
 - Calcium phosphate
 - Hydrogen gas
22. Acidification mostly harms:
- Adult fish
 - Larval and egg stages
 - Aquatic plants
 - Dolphins
23. Increased CO₂ reduces:
- Dissolved oxygen
 - Glucose production
 - Light penetration
 - Nitrogen content
24. Organisms with exoskeletons that depend on calcification are:
- Whales and fish
 - Corals, mollusks, sea urchins
 - Algae and plants
 - Bacteria and fungi
25. Increased CO₂ changes calcium carbonate into:
- Calcium bicarbonate (soluble)
 - Calcium oxide
 - Calcium phosphate
 - Calcium chloride
26. Internal skeletons of fish are composed mainly of:
- Calcium carbonate
 - Calcium phosphate and collagen
 - Magnesium salts
 - Lipids
27. Endoskeleton organisms include:
- Corals and urchins
 - Mollusks
 - Fish, dolphins, whales
 - Phytoplankton
28. Lack of CO₂ in water leads to:
- Reduced photosynthesis





- b) Strong respiration
 - c) Improved calcification
 - d) High oxygen solubility
29. Reduced CO₂ affects:
- a) Nitrogen cycle only
 - b) Food chains in aquatic ecosystem
 - c) Oxygen availability
 - d) Salt balance
30. CO₂ deficiency may cause:
- a) Alkalinity
 - b) pH imbalance in water
 - c) More acidification
 - d) Salt precipitation

(B) – Give Reason

1. Oxygen dissolves more in seas and oceans than in rivers.
2. Phytoplankton are considered the main source of oxygen in water.
3. Oxygen is less soluble in water than carbon dioxide.
4. Solubility of gases decreases with rising temperature.
5. Increasing dissolved oxygen improves metabolism of aquatic organisms.
6. Increased CO₂ causes acidification of water.
7. High levels of CO₂ reduce the strength of corals and mollusks.
8. Endoskeleton organisms like fish are affected by high CO₂.
9. Deficiency of CO₂ reduces photosynthesis in aquatic plants.
10. Changes in CO₂ levels disrupt aquatic food chains.



Theme: (1) – chapter (1) - lesson (8)

The effect of light & solar radiation on aquatic environments

- If you dive into the sea, you will notice that the intensity of light decreases as you dive deeper into the water.
- This has a direct effect on living organisms such as photosynthesis.



Solar radiation

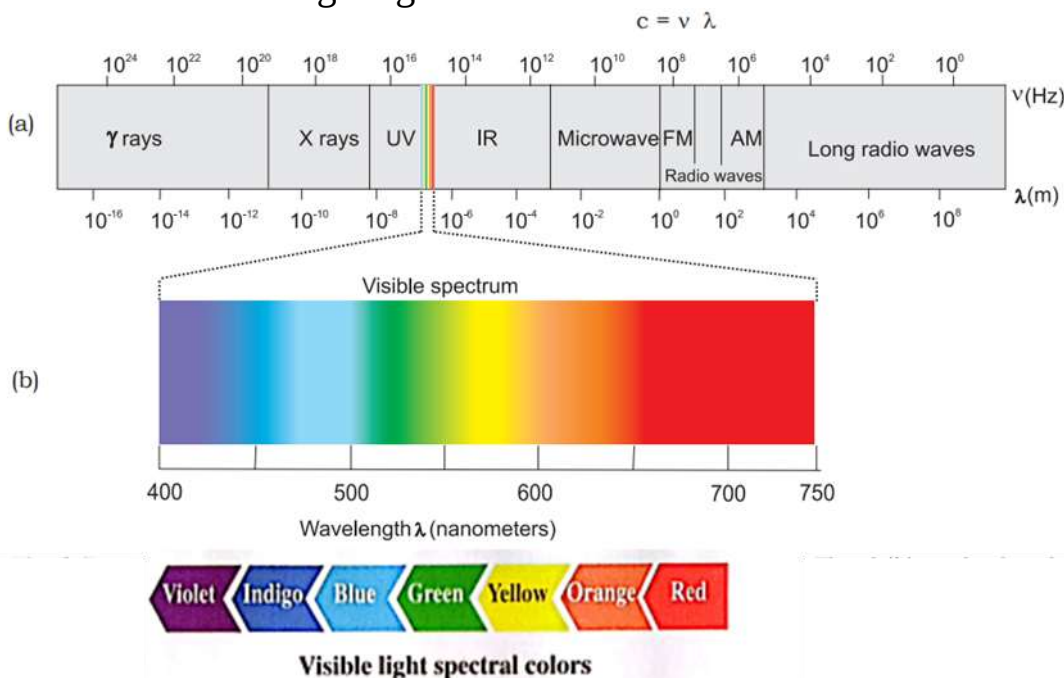
Solar radiation

Refers to the energy produced by the sun and some of it reaches the Earth & represents the primary source of energy in most processes that occur in Atmosphere & Hydrosphere & Biosphere

Electromagnetic spectrum and visible light

Electromagnetic spectrum

Solar radiation propagates as electromagnetic waves such as visible light, which represents a small part of the electromagnetic spectrum. Electromagnetic waves differ in wavelength (λ) and frequency (ν), as shown in the following diagram:

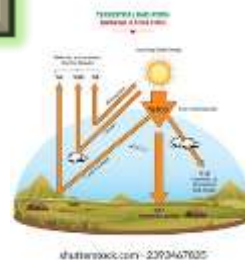




Propagation of Solar Radiation in Water

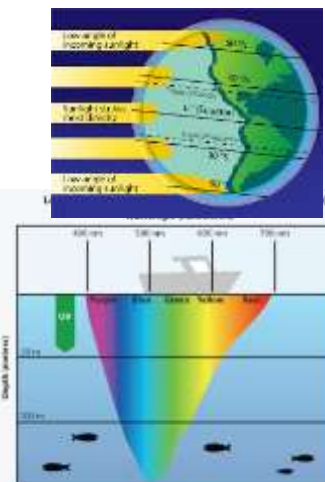
When sunlight falls on the surface of ocean water

1-A part of the sunlight is reflected from the water surface back into the atmosphere, where the amount of reflected energy from the water surface depends on the angle at which sun rays hit the water surface. So, if the sun rays hit the water surface



<u>Perpendicularly</u>	<u>Inclined (at an angle):</u>
a small part of sunlight gets reflected	a large part of sunlight gets reflected

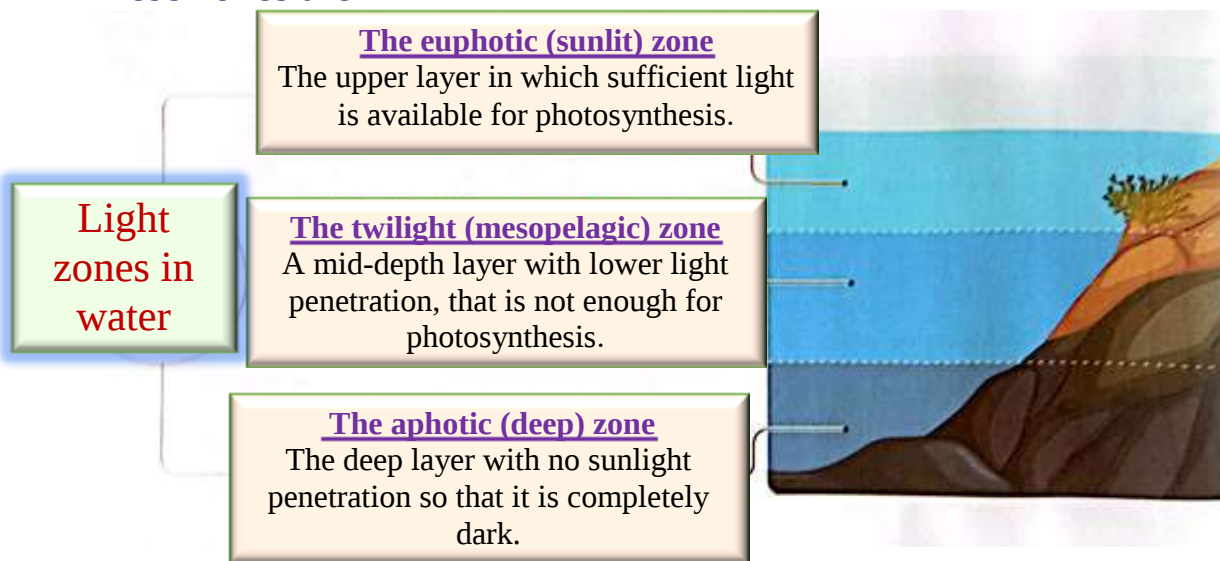
2-The rest of the sunlight enters the water and propagates inside it, and as it propagates, a portion of it gets absorbed by water, aquatic plants, algae, and phytoplankton, while another part gets scattered. Hence, its intensity gradually decreases, creating different light zones in the water



Light zone in water

As the depth of water increases, the intensity of light gradually decreases. This light gradient forms different light zones in the oceans, in which marine organisms are distributed according to their ability to adapt to the available amount of light.

These zones are





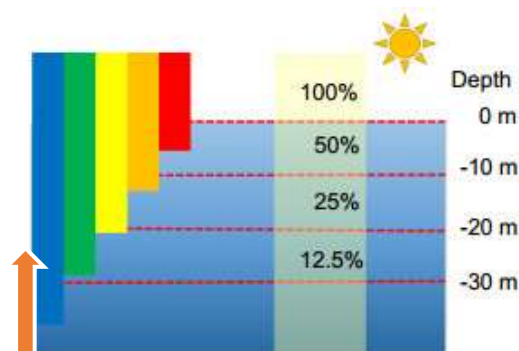
The propagation of solar radiation in the euphotic zone

As solar radiation propagates in the upper zone (euphotic zone), we find that

1-Infrared rays are completely absorbed within 10 cm of depth from the surface

2-Visible light, at a depth of

<u>10 m</u>	About <u>50%</u> of its energy is absorbed
<u>20 m</u>	About <u>75%</u> of its energy is absorbed
<u>30 m</u>	About <u>87.5%</u> of its energy is absorbed
<u>100 m</u>	About <u>99%</u> of its energy is absorbed, about <u>1%</u> of visible light, mostly in the blue spectrum, reach that depth



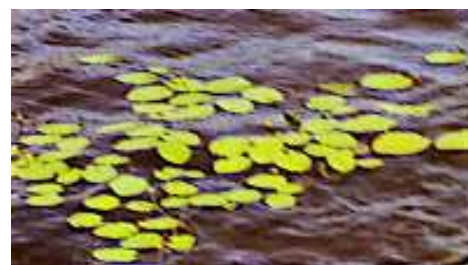
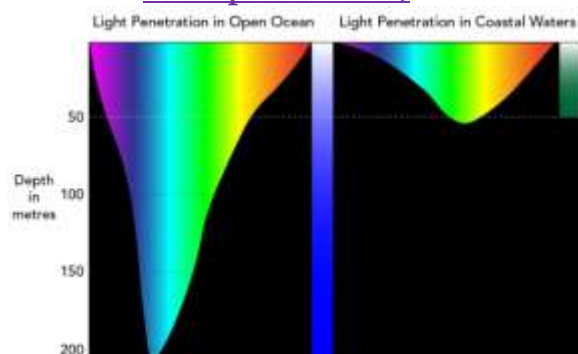
G.R. the deeper parts of the ocean appear blue,

While the shallower parts may appear green or even red

The absorption of light colors in ocean water depends on their different wavelengths, where water absorbs the longer wavelengths (warmer colors such as red, orange, and yellow) faster than the shorter wavelengths (cooler colors such as blue and violet), which are scattered more before being absorbed.

The absorption of light by water as it penetrates shallow coastal waters differs from that in the open ocean, as shown in the following figure

+



Autotrophic organisms (such as aquatic plants, algae, and phytoplankton) thrive in the surface layers of the ocean water depending on the availability of sufficient sunlight to carry out the photosynthesis process that converts solar energy into chemical energy used for building organic compounds necessary for growth and survival.

Solar radiation is considered a vital factor in maintaining the ecological balance in aquatic environments. This is attributed to

Its direct
effect on

Photosynthesis process, which is essential for marine life.

The water temperature and the aquatic organism's



The effect of solar radiation on the ecological balance in aquatic (marine) environments



1-The role of solar radiation in the distribution of marine organisms

Marine organisms are unevenly distributed in water according to their need for light and energy. For example

<u>The surface layers of water</u>	<u>The shallow warm water near the equator</u>
Solar radiation	
The solar radiation is plentiful (abundant)	The solar radiation is available throughout the year
The organisms that depend on photosynthesis are abundant	Coral reefs flourish (thrive), as this radiation stimulates the growth of the symbiotic algae that live inside the coral tissues and provide them with .nourishment
Algae - Phytoplankton	Algae - Coral reefs



The symbiotic relationship between algae and coral reefs is a mutually beneficial relationship as

1-Corals provide protection, carbon dioxide gas, and minerals such as nitrogen and phosphorus for algae.

2-Algae provide oxygen gas that is required for the respiration of coral reefs through the photosynthesis process and also



provide them with nourishment

2-The effect of solar radiation on water temperature

Solar radiation directly affects the water temperature, which in turn affects the distribution of the aquatic organisms. So, we find that

Marine organisms are distributed in:

<u>Tropical aquatic regions</u>	<u>Aquatic regions further from the equator</u>
<u>Solar radiation</u>	
abundant	Not available
<u>Water temperature</u>	
Warm	Cold
<u>The distribution of living organisms</u>	
Warm waters attract certain types of fish and marine animals that require certain temperatures to survive and reproduce	Cold waters are characterized by the presence of other types of fish that prefer to live in them
  Barracuda fish Tuna fish	 Cod fish

3- Changes in solar radiation intensity

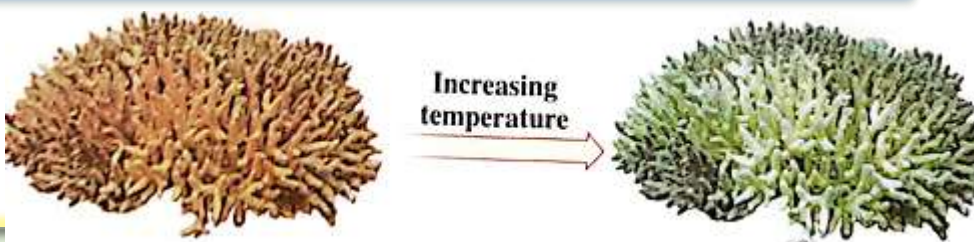
Changes in solar radiation intensity, due to seasonal or climate change, can lead to a disturbance in the ecological balance. For example

1) Water in polar regions

- 1-Solar radiation is low or nearly absent during winter
- 2-So, the rate of photosynthesis greatly decreases
- 3-This can lead to decreasing the number of organisms that depend on photosynthesis
- 4-Which affects the availability of food for marine organisms
- 5-So, it will affect the whole food chain



4-The effect of solar radiation on ocean currents



1st Seco 1st term

1/2



4-The formation of ocean currents that play a major role in

- 1-The distribution of heat and nutrients in oceans
- 2-Which makes some regions richer in nutrients than others
- 3-So, they affect the distribution of marine life

For example, the Gulf Stream

It is one of the oceanic currents that is characterized by carrying low-dense warm water from the equator towards the North Atlantic Ocean, which leads to Mild (moderating) the climate of some regions such as Western Europe
 Enhancing the biodiversity of the marine life



Chapter One (I) Lesson (8)

Choose the correct answer

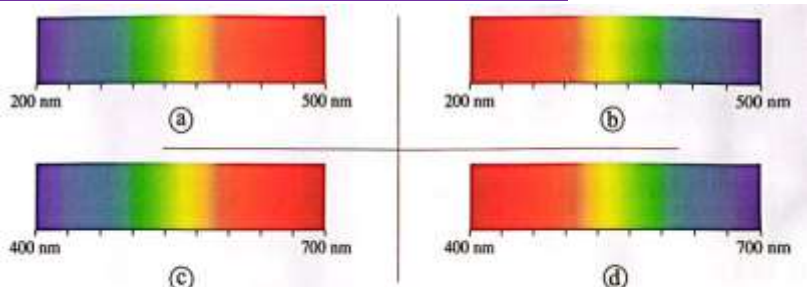
1- The energy of solar radiation can be converted into

- a. electrical energy b. chemical energy
c. thermal energy d. all of them

2-In which of the following electromagnetic spectrum regions, the waves have the shortest wavelengths?

- a. Radio waves. b. Visible light. c. X-rays. d. Gamma rays.

3-Which of the following figures correctly represents the range of wavelengths of the visible spectrum and the order of its color?



4-The opposite diagram shows four regions in the electromagnetic spectrum, which of the following choices represents regions (A) and (B), respectively?

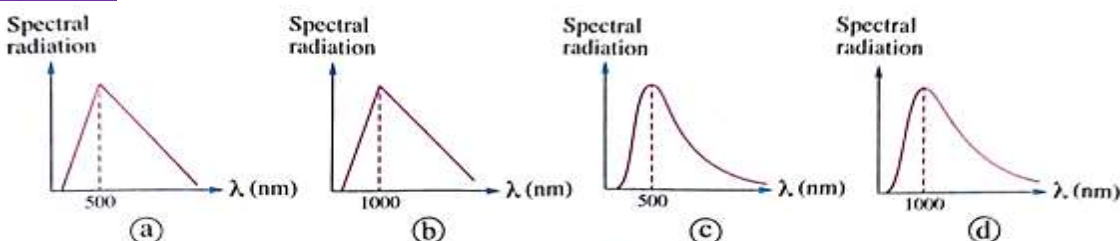
Region (A)	Visible light	Ultraviolet rays	Region (B)
------------	---------------	------------------	------------

- a. X-rays, Gamma rays. b. Infrared rays, Microwaves.
c. X-rays, Infrared rays. c. Infrared rays, X-rays.

5- When solar radiation passes from space into the Earth's atmosphere,

- a. it reaches the Earth's surface completely
b. most of it reaches the Earth's surface
c. it gets scattered completely in the atmosphere
d. it gets absorbed completely in the atmosphere

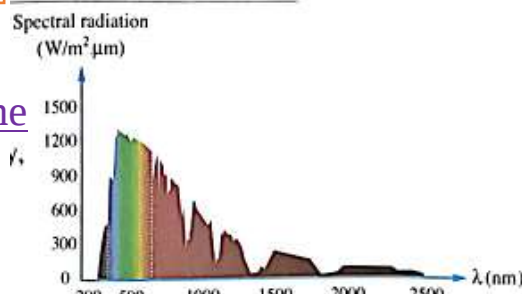
6-Which of the following graphs represents the spectral range of solar radiation at sea level?





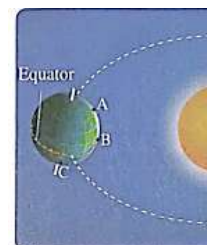
7-The opposite graph represents solar radiation at sea level, so the ratio between the intensities of the wavelengths 500 nm and 1500 nm of solar radiation, respectively.

- a. greater than 1 b. less than 1
 c. equal to 1 d. indeterminable



8-The opposite diagram represents solar radiation falling on the Earth's surface, so the correct order of the regions (A), (B) and (C) on the diagram in terms of the intensity of radiation they receive is

- a. $A > B > C$ b. $C > B > A$
 c. $B > A > C$ d. $B > C > A$

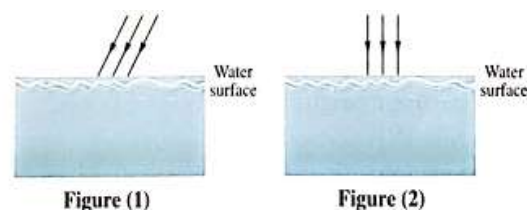


9-Which two quantities of the following decrease in magnitude with increasing depth in the Red Sea water in summer?

- a. Water density and its pressure. b. Water density and its temperature.
 c. Water temperature and its pressure. d. Water temperature and light intensity through it.

10-Two beams of solar radiation of equal intensity are incident on the surface of water, one, is inclined and the other is perpendicular, as shown in the opposite figures, so the reflected light energy from the surface will be

- a. greater in figure (1) b. greater in figure (2)
 c. equal in the two figures d. zero in the two figures



11-When solar radiation passes through the surface layer of ocean water,

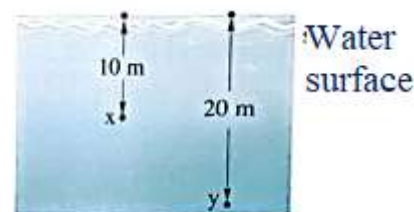
- a. the longer wavelengths of visible light are firstly absorbed
 b. the shorter wavelengths of visible light are firstly absorbed
 c. all wavelengths of visible light are completely absorbed together
 d. none of the wavelengths of visible light is absorbed

12-The sea appears blue because

- a. water does not absorb the wavelengths of blue light
 b. the water surface reflects the wavelengths of blue light
 c. the wavelengths of blue light penetrate deeper into water compared to other colors
 d. water absorbs the wavelengths of blue light first

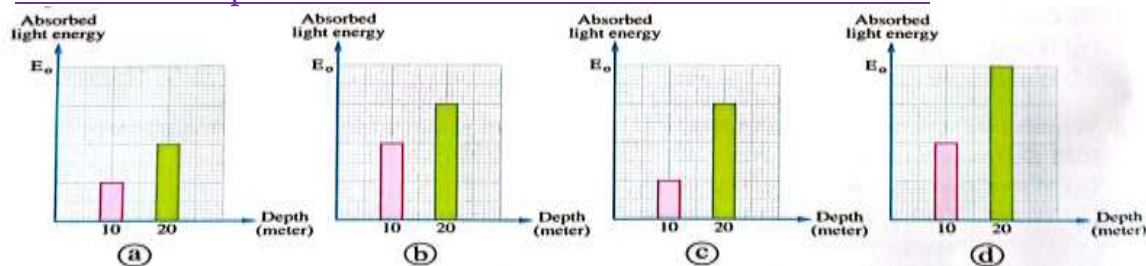
13-The opposite figure shows two points (x) and (y) at different depths inside the ocean water. If the energy of visible light at point (x) is E, the energy of visible light at point (y) is approximately equal to

- a. E b. $\frac{1}{2} E$ c. $\frac{1}{3} E$ d. $\frac{1}{4} E$





14-Solar radiation falls perpendicularly on the surface of the ocean water with energy E_0 . Which of the following graphs represents the approximate ratios of the energy of visible light absorbed at depths of 10 m and 20 m from the water surface?



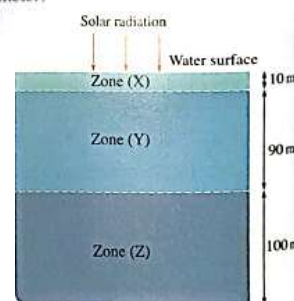
15-The opposite diagram shows solar radiation being incident on the surface of the ocean water, so:

(1) Infrared rays are completely absorbed while passing through

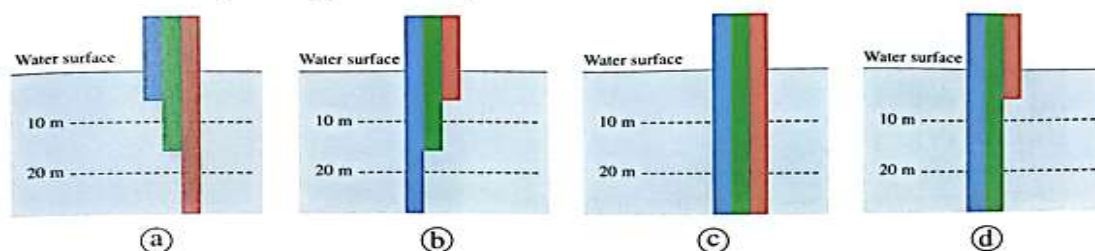
- a. Zone (X) b. zone (Y)
c. zone (Z) d. the end of zone (Z)

(2) The energy of visible light becomes approximately 1% of the energy of visible light incident on the water surface at the end of zone

- a. (X) b. (Y) c. (Z) d. no right answer

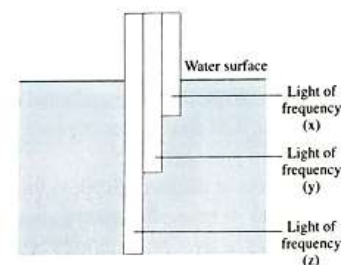


16-When solar radiation is incident on the surface of the ocean water, which of the following diagrams correctly represents how deep red, green, and blue light penetrates through the water within a depth of approximately 20 meters from the surface?

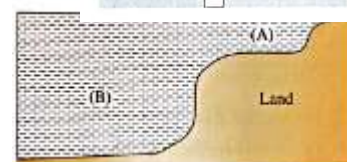


17-The opposite diagram shows three beams of visible light with frequencies x, y, and z passing through ocean water, so the correct order of the frequencies of these beams is

- a. $x > y > z$ b. $z > y > x$
c. $x = y = z$ d. $z > x > y$



18-The opposite diagram illustrates two different regions of the ocean: a shallow coastal region (A) and an open ocean region (B). How do the colors of the two regions (A) and (B) appear respectively?



	Region (A)	Region (B)
a	Bluish	Greenish
b	Reddish	Greenish
c	Greenish	Bluish
d	Bluish	Reddish

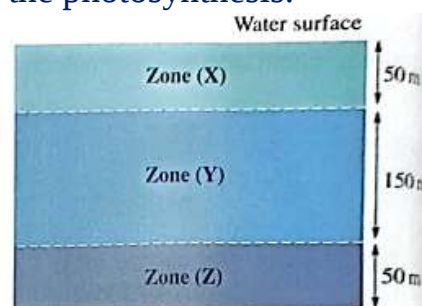


19-The main condition for the existence of plants in abundance in an aquatic environment is the

- a. availability of fresh water b. increase in the salinity level
- c. decrease in carbon dioxide gas level
- d. availability of a suitable amount of light for completing the photosynthesis.

20-The opposite figure represents three zones (X), (Y), and (Z) in the ocean water. Which of these zones is the most suitable for the existence of autotrophic algae in it?

- a. Zone (X)
- b. zone (Y)
- c. zone (Z)
- d. The three zones are of the same probability.



21-Which of the following fish can be found in the Atlantic Ocean at the equator?

- a. Cod fish only. b. Tuna and cod fish.
- c. Barracuda fish only. d. Barracuda and tuna fish

22- If you know that barracuda and cod fish can't be found together at the same latitude in the ocean. This is because each of them

- a. is a predatory fish
- b. lives at different depths in the ocean
- c. has its own adaptation to a certain temperature
- d. has its own adaptation to a certain light intensity

23- In which of the following seasons does the decline rate in the number of marine organisms in polar regions increase?

- a. At summer b. At spring c. At fall d. At winter

24- From the marine organisms that live in the cold regions is/are

- a. Coral reefs b. Cod fish c. Tuna fish d. Barracuda fish

Give Reason Questions

1. Light intensity decreases as you dive deeper into the sea.
2. Solar radiation is considered the primary source of energy for most processes on Earth.
3. A larger part of sunlight is reflected when sun rays hit the water surface at an inclined angle.
4. The deeper parts of the ocean appear blue.
5. Infrared rays are absorbed within the first few centimeters of ocean water.
6. Autotrophic organisms such as algae and phytoplankton thrive in surface layers of water.
7. Coral reefs flourish in shallow warm waters near the equator.
8. Marine organisms are distributed differently in tropical and polar regions.
9. In polar regions, photosynthesis greatly decreases during winter.
10. The Gulf Stream current enhances marine biodiversity in the North Atlantic Ocean.

Theme: (1) – chapter (1) - lesson (9)

The effect of water pressure on living organisms

Organisms living in the deep oceans are exposed to an extreme environment that requires special adaptations for survival, such as living under **enormous water pressure**. This raises important questions:

- How does hydrostatic pressure affect organisms in the deep sea?
- What physiological adaptations help these organisms survive under such tremendous pressure?

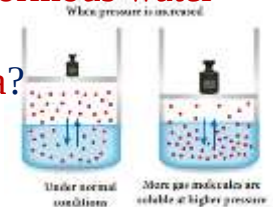


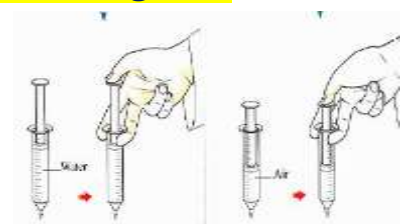
Figure 9.2 Effect of pressure on solubility

Fluids

are substances that can flow, including both liquids and gases.

However, **gases** are easily **compressed** and can occupy any available space, while **liquids** resist compression and therefore, maintain almost the same volume under pressure.

This unique property allows liquids to play a crucial role in helping deep-sea organisms withstand high pressure.



Pressure at a Point in a Static Fluid

There is pressure exerted on any point within a liquid, equivalent to the **weight of the liquid column above that point** and acting on the **unit area surrounding it**.

If an object is placed at that point, it will be subjected to a **force due to this pressure**, and this force will be **perpendicular** to its surface.



The compressive force **Newtons**

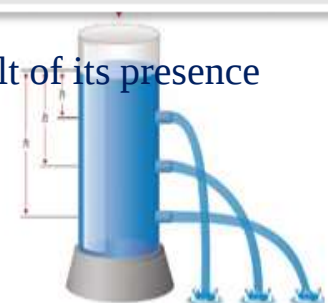
The compressive force

The compressive force on an object is calculated in as a result of its presence within the fluid – using the following relationship:

$$F = P \times A$$

Where **P** is the pressure at that point, in **N/m²**, and **A** is the surface area exposed to that pressure, in **m²**.

The compressive force on a body immersed in a liquid





Hydrostatic Pressure

Hydrostatic pressure is the pressure exerted by water at any point beneath its surface. This pressure increases as the depth (h) from its surface increases, due to the increased weight of water acting on the unit area at that point.

Pressure within water also increases with an increase in water density (ρ).

The pressure at a specific depth in seawater is greater than the pressure at the same depth in freshwater from a lake, due to the higher concentration of salt and suspended particles in seawater.



"Pressure increases with depth"

At sea level, the pressure is equal to the atmospheric pressure (Pa)

- The standard atmospheric pressure at 0°C is equal to 1 atmosphere (1 atm.), which is equivalent to $(1.013 \times 10^5 \text{ N/m}^2)$.

Water pressure increases by approximately one atmospheric pressure for every 10 meters below the surface. For example, at a depth of 100 meters, the pressure caused by the water will be about 10 times the atmospheric pressure. Therefore, the total pressure at this depth will be 11 times the atmospheric pressure. Thus, the total pressure at the point is:

$$P = P_a + P_{\text{water}}$$

In the depths of the sea, the pressure can be unimaginable. Despite this, many marine organisms can adapt to the high-water pressure.

Effect of Pressure on Biological Adaptations of Marine Organisms:

First: The Swim Bladder

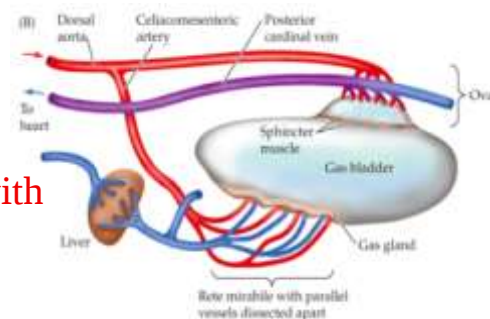
1-Surface Organisms:

Organisms living near the water surface face relatively low hydrostatic pressure, and thus their body structures are less robust compared to organisms living in deeper waters.

2-Mesopelagic Organisms (Intermediate Depths):

At greater depths, from 200 to 1000 meters, living organisms are more specialized to cope with increased pressure.

For example, some fish have swim bladders filled with gas, which helps them control their buoyancy and balance in water. Salmon fish are prime examples, migrating between different depths of the sea and rivers.



3-Bathyal and Abyssal Organisms (Deep-Sea Organisms):

At very great depths (over 2000 meters), the hydrostatic pressure is **extremely intense**. Organisms living in these environments often have **compact body structures** and internal protein components and mechanisms that enable them to withstand high pressure. Additionally, some of these organisms do not possess gaseous bladders to ensure they don't collapse under this pressure, such as the ray fish. Alternatively, they may have bladders that contain liquids instead of gases and rely on their large, oil-rich liver to increase buoyancy and control depth.



Ray fish

Secondly: The Skeletal System: Bony and Cartilaginous

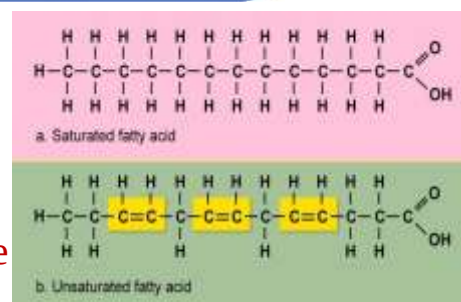
Bony fish (Osteichthyes),	Cartilaginous fish (Chondrichthyes),
such as Tilapia and Mullet, are characterized by having a bony skeleton made of bones . This provides strong support for the fish's body and stability against various pressures, such as water movement or water pressure.	such as sharks and rays, are a group of fish characterized by having a cartilaginous skeleton instead of a bony one . Cartilage is a more flexible and lighter tissue compared to bone, which gives cartilaginous fish a distinct flexibility compared to bony fish



Third: Cell Membranes

Deep-sea fish have evolved unique adaptations in their cell membranes to withstand the immense pressure in the abyssal depths. This is achieved by increasing the levels of unsaturated fatty acids in the composition of their cell membranes.

These fatty acids help maintain the fluidity and stability of the membranes under pressure, thereby preventing cell damage.



Chapter One (I) Lesson (9)

Choose the correct answer

1. Fluids include (liquids only – gases only – both liquids and gases).
2. Gases differ from liquids because they are (easily compressed – resist compression – have fixed shape).
3. Liquids maintain almost the same (volume – pressure – density) under pressure.
4. The pressure at a point in a liquid is caused by (temperature – water column weight – surface tension).
5. The SI unit of pressure is (N – N/m – N/m²).
6. The compressive force on an object is given by ($F = m \times g$ – $F = P \times A$ – $P = \rho gh$).
7. Hydrostatic pressure increases with (depth – time – temperature).
8. Seawater pressure at the same depth is (less than – equal to – greater than) freshwater pressure.
9. Standard atmospheric pressure equals ($1 \text{ atm} = 1.013 \times 10^5 \text{ N/m}^2$ – $1 \text{ atm} = 1.013 \times 10^3 \text{ N/m}^2$ – $1 \text{ atm} = 1.013 \times 10^7 \text{ N/m}^2$).
10. Water pressure increases by ~1 atmosphere every (5 m – 10 m – 50 m).
11. At 100 m depth, water pressure is (1 atm – 10 atm – 11 atm).
12. At sea level, the pressure is equal to (0 atm – 1 atm – 2 atm).
13. Organisms near the water surface have (weak body structures – very strong bodies – no adaptations).
14. Mesopelagic organisms live at depths of (0–200 m – 200–1000 m – 2000–4000 m).
15. Salmon fish use (lungs – gas-filled swim bladder – oil-rich liver) to regulate buoyancy.
16. Bathyal & abyssal organisms live at depths (less than 200 m – 200–1000 m – more than 2000 m).
17. Deep-sea organisms lack gaseous bladders because they (collapse under pressure – increase buoyancy – store oxygen).
18. Ray fish depend on (gas bladder – oil-rich liver – lungs) for buoyancy.
19. Bony fish have skeletons made of (cartilage – bone – fat).
20. Cartilaginous fish have skeletons made of (bone – cartilage – calcium phosphate).
21. Tilapia and mullet are (bony fish – cartilaginous fish – amphibians).
22. Sharks and rays are (Osteichthyes – Chondrichthyes – amphibians).
23. Cartilage is (heavier and rigid – lighter and flexible – denser and stiff).
24. Cell membranes of deep-sea fish contain high levels of (saturated fat – unsaturated fatty acids – proteins only).
25. Unsaturated fatty acids help membranes stay (rigid – fluid – compressed).
26. Pressure increases with (depth and density – temperature and time – current and waves).
27. Swim bladder helps fish in (digestion – buoyancy – respiration).
28. Organisms at great depth often have (gas bladders – compact bodies and proteins – no adaptations).
29. Deep-sea organisms survive enormous pressure because of (fragile skeletons – special adaptations – strong muscles only).
30. Adaptations of abyssal fish prevent (photosynthesis – collapse under pressure – buoyancy control).



Give Reason Questions

1. ☐ Part B – 10 Give Reason Questions

2. Liquids resist compression while gases are easily compressed..
3. Hydrostatic pressure increases with depth.
4. Pressure at the same depth in seawater is greater than in freshwater.
5. At 100 m depth, total pressure is about 11 atm.
6. Surface organisms have weaker body structures.
7. Some mesopelagic fish have gas-filled swim bladders.
8. Deep-sea organisms lack gaseous bladders.
9. Ray fish can survive in deep seas.
10. Cartilaginous fish are more flexible than bony fish.
11. Deep-sea fish cell membranes contain more unsaturated fatty acids.





Chapter One (I) Lesson (6)

First: Choose the correct answer

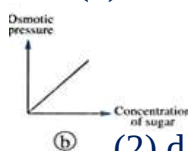
- 1- c. The change in the physical structure of the living organism to help it survive in its environment
- 2- a. The presence of big eyes 3- b. Compressed bodies
- 5- a. Large fins and the streamlined body 4- d. The presence of fine blood capillaries
- 6- a. They allow the extraction of dissolved oxygen in water
- 7- a. Cellular respiration 8- d. Streamlined body, mucus, and scales
- 9- c. air bladder 10- b. The presence of contractile vacuole
- 11- d. Rivers 12- b. Migrating from the river to the sea, then returning back
- 13- a. The daily migration of some fish species
- 
- The diagram illustrates osmosis across a semi-permeneable membrane. On the left side, labeled "Saltwater", there are more solute particles represented by small black dots. On the right side, labeled "Fresh water", there are fewer solute particles. A vertical line in the center represents the semi-permeable membrane. Two arrows indicate the movement of water molecules: one arrow points from the saltwater side to the fresh water side, and another arrow points from the fresh water side back to the saltwater side, representing the net movement of water.



- 14- c. Smoltification
15- b
16- d. Each of the physiological and behavioral adaptations depends on the other
17- c. For reproduction
18- c. The ability to modify the level of salt in their bodies
19- b. The suitability of the organism to the conditions of the environment where it lives.
20- d. A modification in the living organism's action to perform some vital functions.
21- d. By containing high concentration of hemoglobin in blood
22- d. Large-sized gills 23- a. Slowing down the metabolism rate
24- d. Increasing the efficiency of respiration 25- b. High-concentrated solution
26- b. allowing the passage of water only
27- a. The concentration of water in the solution of region (X) is higher than that in the solution of region (Y)



- 28-d. The concentration of solvent in solution (1) is higher than that inside the cell
- 29- a   30- Osmotic pressure



- 31-(1) D- Cell no. (4) to cell no. (1) (2) d. All cells shrink
32- b. The molecules of solvent transfer from (2) to (1)
33- b. 20 g/ L 34- c. having low osmotic pressure
35- c. The concentration of the dissolved 36- b. Water transfers from the funnel to the beaker
37- d. Contractile vacuole 38- d. Kidneys
39- a. Oceans water 40- b. smaller than 1 41- c
42- c. Urea 43- b. the concentrate of urine that they produce
44-1- c. the rate of urine excretion 2- b. Between 350x: 1000x is lower
45- c. The contractile vacuoles or kidneys
46- b. Increasing the osmotic pressure and decreasing the water loss
47- b. Having a higher osmotic pressure inside its contractile vacuole than that of its medium
48- d. Red blood cell 49- c. The ability to get rid of the excess water 50- b
51- a. Physiological and behavioral adaptations 52- d. being able to breathe





Chapter One (I) Lesson (7)

(A) – Choose the correct answer

1. b) Atmospheric air
2. c) Waves and water currents
3. b) Phytoplankton, algae, and aquatic plants
4. b) Photosynthesis
5. c) Respiration
6. b) Oxidation of glucose
7. b) Atmosphere
8. b) Respiration of marine organisms
9. b) Industrial pollution
10. b) Photosynthesis
11. b) Ability of solute to dissolve in a solvent at given T and P
12. c) 50 times lower
13. b) Lower by 20–30%
14. b) Decreases with temperature rise
15. b) Carbon dioxide
16. c) Improved respiration
17. b) Metabolism and growth
18. b) Be more active in swimming and reproduction
19. b) Adequate oxygen
20. c) Acidification
21. b) Carbonic acid (H_2CO_3)
22. b) Larval and egg stages
23. a) Dissolved oxygen
24. b) Corals, mollusks, sea urchins
25. a) Calcium bicarbonate (soluble)
26. b) Calcium phosphate and collagen
27. c) Fish, dolphins, whales
28. a) Reduced photosynthesis
29. b) Food chains in aquatic ecosystem
30. b) pH imbalance in water

(B) – Give Reason

1. Because waves and water currents increase gas exchange between air and water
2. Because they perform photosynthesis, releasing oxygen and forming the base of the aquatic food chain
3. Because CO_2 has higher solubility (50 times more) than O_2 due to its chemical nature
4. Because increasing temperature increases the kinetic energy of molecules, reducing gas dissolution in water
5. Because oxygen is required for cellular respiration, producing energy that supports growth and activity
6. Because CO_2 dissolves forming carbonic acid (H_2CO_3), which lowers water pH

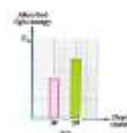
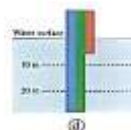




7. Because CO₂ converts calcium carbonate into soluble calcium bicarbonate, preventing calcification of shells
8. Because increased CO₂ disturbs calcium balance in their bodies, impairing bone growth
9. Because CO₂ is the raw material for photosynthesis; less CO₂ limits carbohydrate production
10. Because phytoplankton and algae (producers) depend on CO₂; any change affects higher organisms in the chain

Chapter One (I) Lesson (8)

- 1- d. all of the above
- 2- d. Gamma rays
- 3- c.
- 4- c. Infrared rays, X-rays
- 5- b. most of it reaches the Earth's surface
- 6- c.
- 7- a. greater than 1
- 8- c. B>A>C
- 9- d. Water temperature and light intensity through it
- 10- a. greater in figure (1)
- 11- a. the longer wavelengths of visible light are firstly absorbed
- 12- c. the wavelengths of blue light penetrate deeper into water compared to other colors
- d. water absorbs the wavelengths of blue light first
- 13- b. $\frac{1}{2}$ E
- 14- b.
- 15- (1) a. Zone (X)
- (2) b. (Y)
- 16- d.
- 17- b. $z > y > x$
- 18- c. Greenish/ Bluish
- 19- d. availability of a suitable amount of light for completing the photosynthesis
- 20- a. Zone (X)
- 21- d. Barracuda and tuna fish
- 22- c. has its own adaptation to a certain temperature
- 23- d. At winter
- 24- b. Cod fish



Give Reason – Answers

1. Because water absorbs and scatters sunlight as it penetrates deeper, reducing its intensity with depth.
2. Because it provides energy for photosynthesis in plants and for driving atmospheric, hydrospheric, and biospheric processes
3. Because reflection increases with the angle of incidence; only a small part is reflected when rays are perpendicular
4. Because water absorbs longer wavelengths (red, orange, yellow) faster, while shorter blue wavelengths penetrate deeper and get scattered
5. Because infrared rays have long wavelengths and low penetration power, so they are absorbed quickly near the surface
6. Because sufficient sunlight is available there, which is essential for photosynthesis to produce food and energy
7. Because solar radiation is abundant year-round, supporting symbiotic algae that provide corals with nourishment and oxygen





8. Because solar radiation affects water temperature; warm tropical waters support species like tuna, while cold polar waters support species like cod
9. Because solar radiation is very low or absent, reducing the energy available for photosynthetic organisms such as phytoplankton
10. Because it carries warm, nutrient-rich water from the equator, moderating the climate and increasing the availability of nutrients for marine life

Chapter One (I) Lesson (9)

1. Choose the correct answer

2. Both liquids and gases
3. Easily compressed
4. Volume
5. Water column weight
6. N/m^2
7. $F = P \times A$
8. Depth
9. Greater than
10. $1 \text{ atm} = 1.013 \times 10^5 \text{ N/m}^2$
11. 10 m
12. 11 atm
13. 1 atm
14. Weak body structures
15. 200–1000 m
16. Gas-filled swim bladder
17. More than 2000 m
18. Collapse under pressure
19. Oil-rich liver
20. Bone
21. Cartilage
22. Bony fish
23. Chondrichthyes
24. Lighter and flexible
25. Unsaturated fatty acids
26. Fluid
27. Depth and density
28. Buoyancy
29. Compact bodies and proteins
30. Special adaptations
31. Collapse under pressure

B – 10 Give Reason Questions

1. Because liquid molecules are very close together, but gas molecules have large spaces between them
2. Because the weight of the water column above increases as depth increases





3. Because seawater is denser due to salts and suspended particles
4. Because water adds 10 atm plus 1 atm atmospheric pressure at the surface
5. Because they live under low hydrostatic pressure
6. Because gas bladders help them control buoyancy at intermediate depths
7. Because gas-filled bladders would collapse under extreme pressure
8. Because they have oil-rich livers and liquid-filled bladders instead of gas bladders
9. Because cartilage is lighter and more flexible than bone
10. Because unsaturated fatty acids keep membranes fluid and stable under high pressure.



حمل الآن

مجاناً وحصرياً

المراجعة رقم (3)

اختبار شهر نوفمبر



Lesson 6

Biological adaptation



Adaptations help organisms to survive in its environment

Types of Adaptations:

- 1) physiological*
- 2) behavioral*
- 3) structural*

A. Physiological (functional) adaptation

It's a modifications in their biological (vital) functions

- 1) some deep- ocean fish have special abilities to regulate respiration when there's oxygen deficiency.*
- 2) To adapt to the high-water pressure at great depths, deep-sea fish have strong and durable arteries and veins to endure high pressure.*
- 3) They adjust their blood pressure to equalize the external pressure.*

Electric Eel

☐ *lives at depths of thousands meters, where O_2 levels are extremely low.*

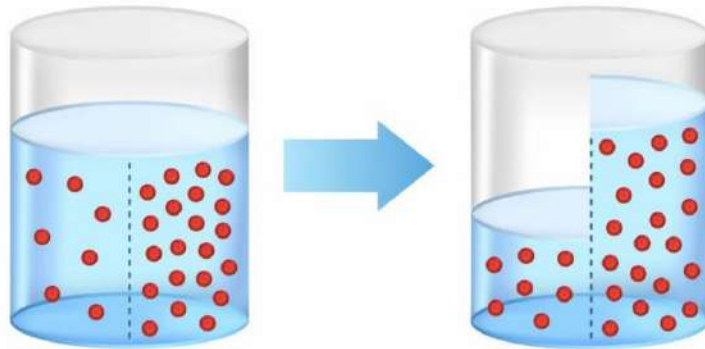
- 1) They developed very large gills with very fine capillaries to maximize the extraction of the little oxygen in water*
- 2) they slow down their metabolism to minimize their oxygen needs.*



Osmosis and osmotic pressure

- **Osmosis** is water transfer from a dilute solution to a concentrated solution through a semi-permeable membrane separating the two solutions.

Osmosis



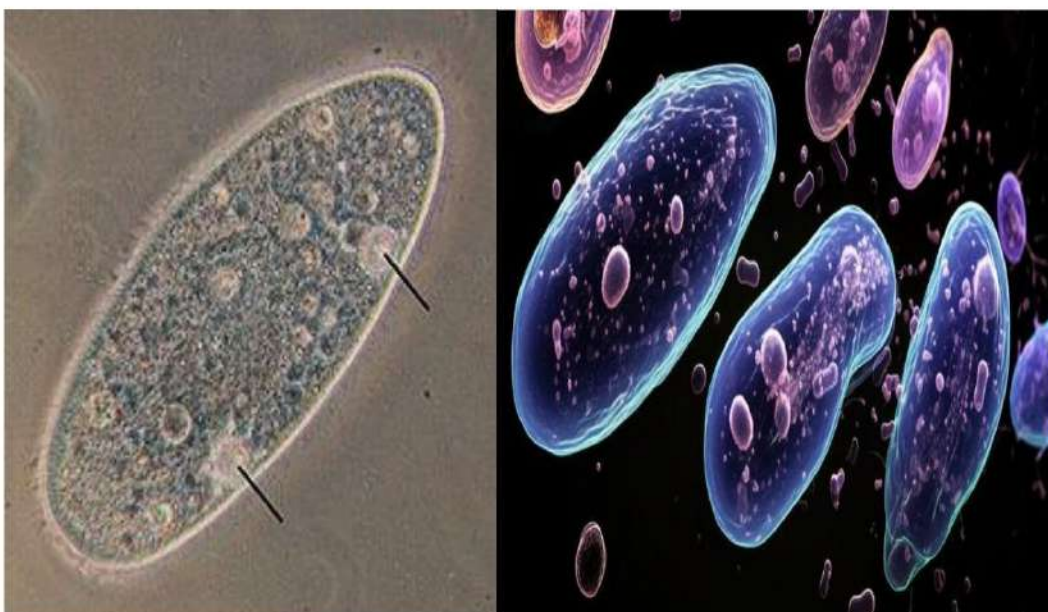
the pressure created from difference in solute concentration in the solution

it leads to the water diffusion of water from the less concentrated solution (low osmotic pressure) to more concentrated solution (higher osmotic pressure).

- the bodies of the organisms will draw large amounts of water when the osmotic pressure of the water is lower than the osmotic pressure of their bodies., causing them to burst and die. So ?????

1-Unicellular organisms (amoeba, paramecium, euglena)

have an organelle called a **contractile vacuole** that collects excess water in the cell and when it is filled with water, it moves towards the cell membrane where it discharges its water to the outside .



2- Multicellular organisms (fish)

(A) *in fresh water* it eliminates excess water through (skin, mouth, gills, by the kidneys as dilute urine.

(B) *in saltwater* it need to swallow large amounts of sea water to compensate for the osmotic loss of water from their body, and then they expel excess salts through their kidneys and specialized cells in their gills.

□ *Sharks* maintain the balance through controlling the level of *urea* in their blood.

Urea is a *nitrogenous compound* that is excreted in the urine to get rid of it.

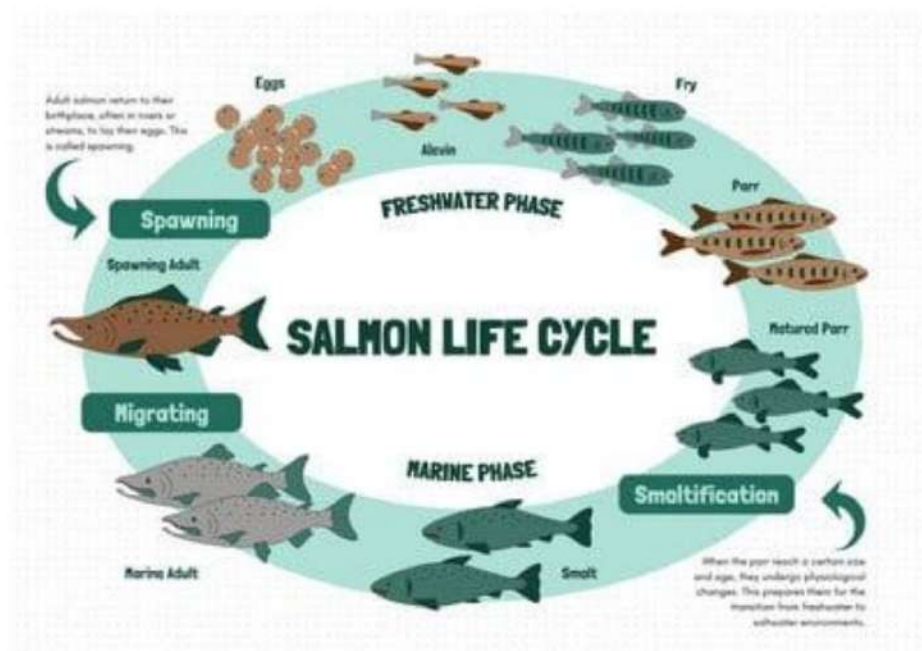
□ *Sharks* keep a high concentration of *urea* in their blood so increases their osmotic pressure, close to the osmotic pressure of surrounding water minimizing the loss of water

B. Behavioral adaptations

it's certain behaviors used to avoid extreme conditions or to better use of available resources.

- 1) *Salmon* are born in freshwater
- 2) *then move to the sea* to spend most of their adult life, before returning to rivers again to reproduce.
- 3) *When eggs hatch*, their young spend the first period of their lives in freshwater, and the youngsters adapt to the freshwater.
- 4) Upon reaching a certain size the fish undergo a process of **Smoltification** allowing them to move to the saltwater of the sea.
- 5) *When reaching a sexual maturity* they return to the rivers to reproduce.
- 6) *They move between salt and fresh water* is bec of their *circulatory and respiratory systems* adapt to changes in salinity ,different amounts of oxygen in fresh ,salt water.





C. *Structural adaptations*

it's the changes in the structure of organisms to help them survive

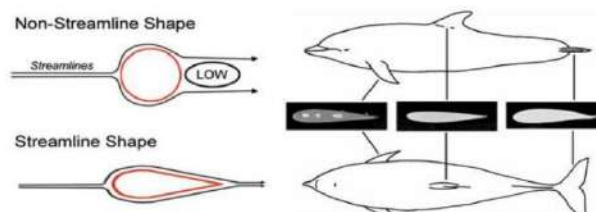
1-fish in the deep Ocean have very large eyes to see in the dark, bodies are compressed to endure the very high pressure in deep water.

Like the icefish: lives in the cold southern oceans at depths of 2000m.



2-streamlined body that reduces water resistance to the movement

Streamlined body shape

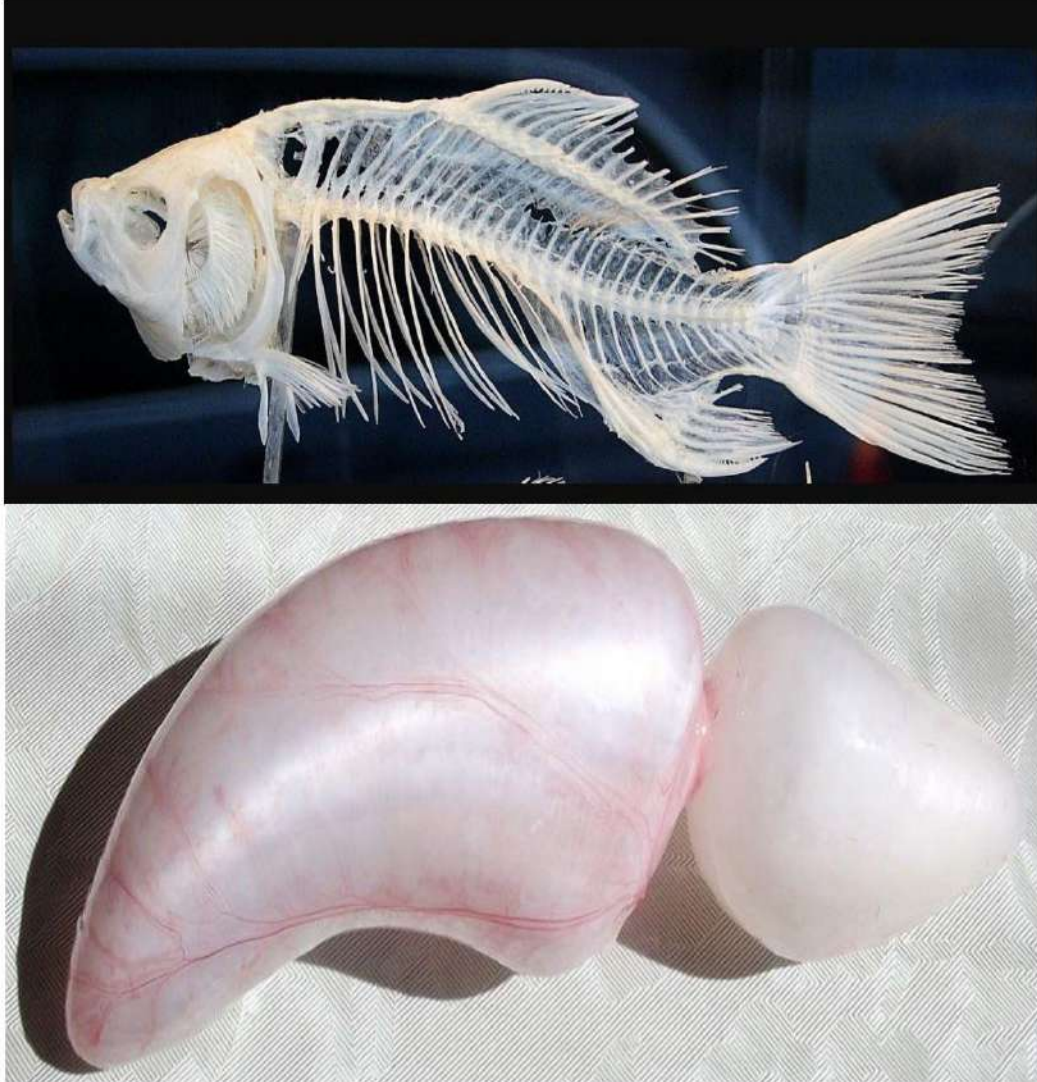


Most aquatic animals have a streamlined body shape that reduces water resistance to enable the animal to move faster in water, e.g. dolphin.

3-**gills** that **extract dissolved oxygen**.

4-**body covered with scales ,mucus** to be **waterproof** to **reduce water resistance**

5-**bony fish** have **air bladder (swim bladder)** helps them float .



6-**Fins** for movement .

7-**Gas exchange** organism obtains oxygen ,removes carbon dioxide.

8-**Cellular respiration** is a process that the organism breaks down the bonds in food molecules (glucose) to obtain stored energy.

9-**Unicellular organisms** such as amoeba **obtain oxygen** and eliminate carbon dioxide through the cell membrane **by diffusion**.



Lesson (7)

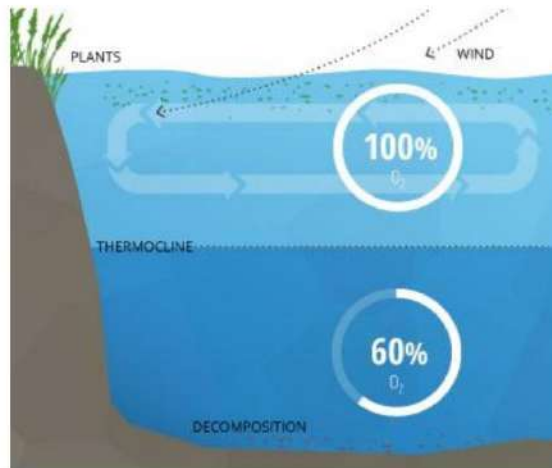


Oxygen and carbon dioxide in the aquatic

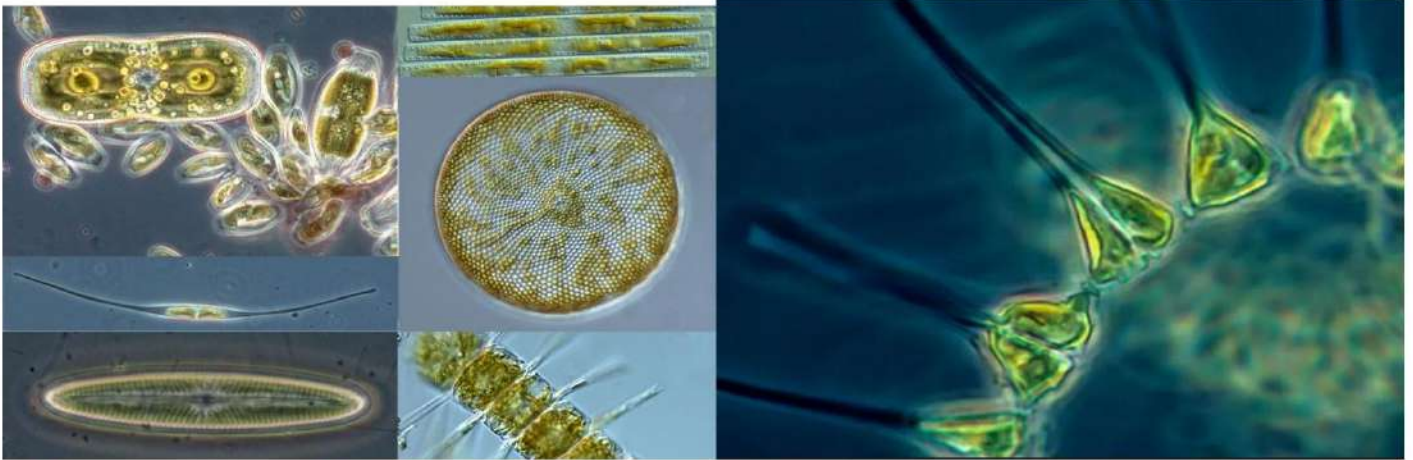
Rivers ,seas contain enough oxygen ,carbon dioxide to keep aquatic life of .

The main source of oxygen in water

1-atmospheric air but it's slightly soluble in water.



2- Phytoplankton ,algae, aquatic plants by process of photosynthesis.



3-In seas ,oceans due to waves ,water currents that increases the gas exchange between the atmosphere ,water.

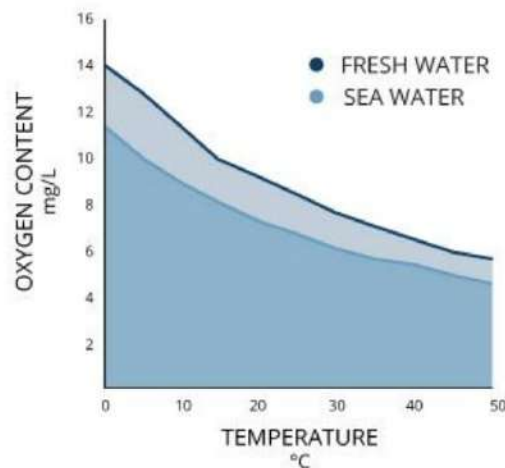


Solubility O_2 , and CO_2 in water

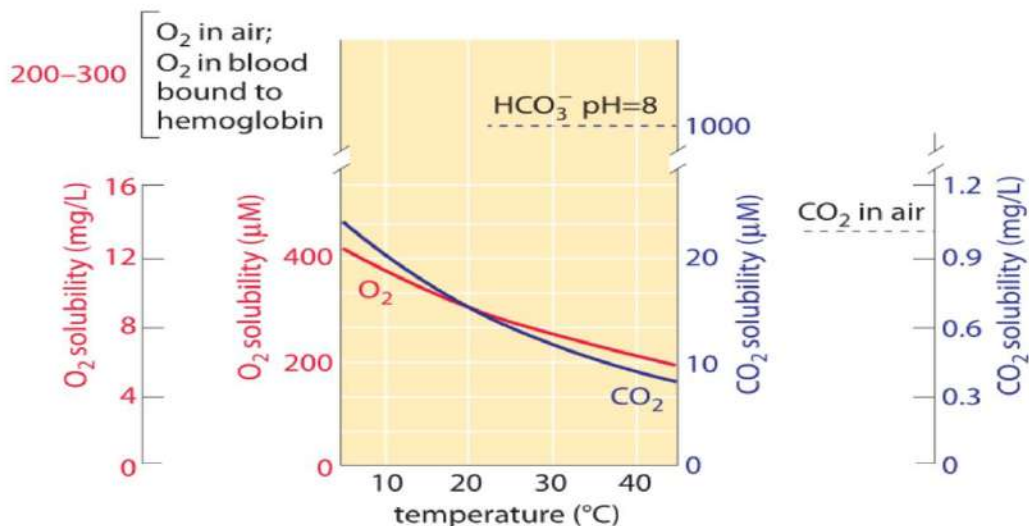
1) The concentration of O_2 in the air is about 500 times of CO_2 , but O_2 is 50 times less soluble in water.

Temperature (°C)	Solubility (m^3 of gas/ m^3 of water)	
	CO_2	O_2
40	0.01361	0.00051
28	0.01876	0.00072
20	0.02115	0.00074
12	0.02852	0.00093

2) The solubility of O_2 , CO_2 in salty water is 20-30% lower than in fresh water.



3) the solubility decreases as the temperature increases, the percentage of CO_2 dissolved in water decreases, but at a greater rate than that of oxygen.



$[O_2]/[CO_2] \approx 20$ but axis scale chosen to show relative slope

Effect of increasing dissolved oxygen in water

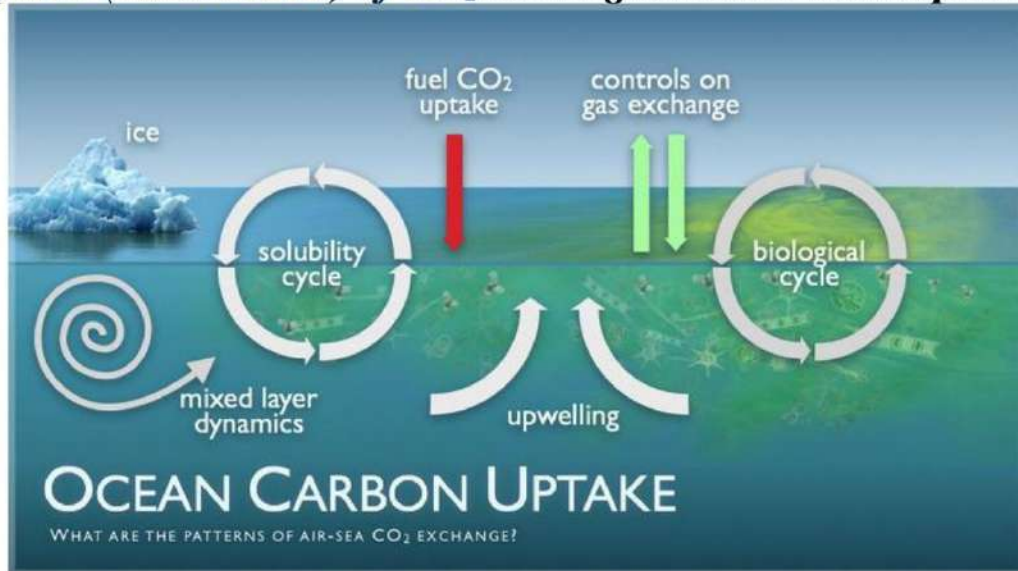
1- Enhancement of respiration: improves the ability to breathe.



- 2- **Improved metabolism:** High O_2 increases metabolism ,growth.
- 3- **Increased activity:** Adequate(**sufficient**) O_2 make organisms more active.
- 4- **keeping the balance of the ecosystem:** A healthy level of O_2 is **Critical(vital)** in maintaining a stable aquatic ecosystem .

Sources of CO_2 in water

- 1- **Atmosphere (main source)** of CO_2 exchanged between atmosphere ,water

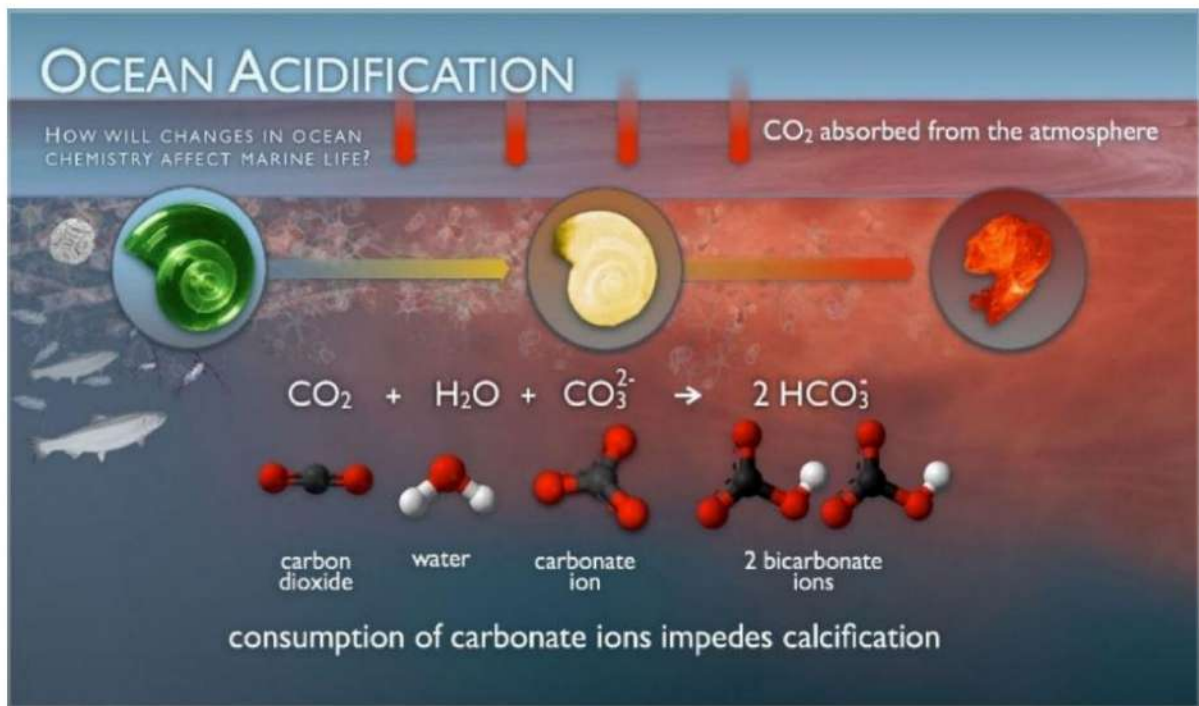


- 2- **Marine organisms:** produce CO_2 as a waste of their metabolism.
- 3- **Human activities :** industrial pollution, decomposition of organic matter .



effect of increased CO_2 in water

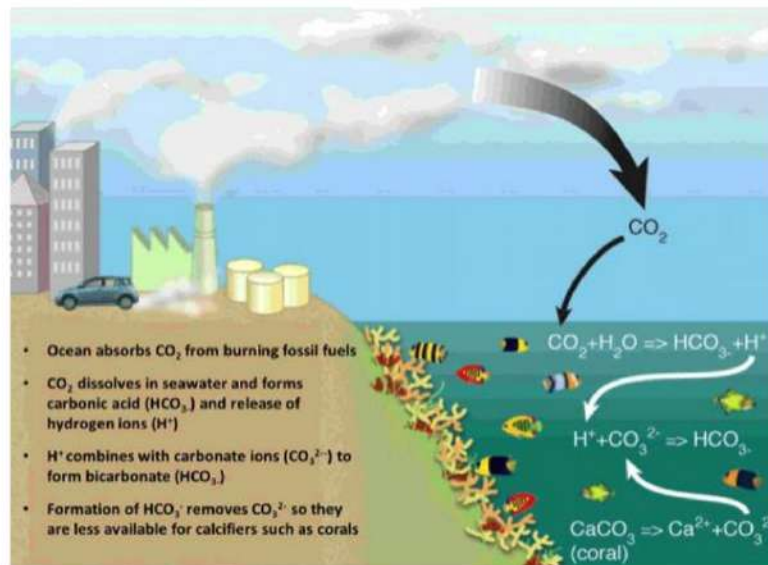
- 1- **Acidification:** When CO_2 levels are high in the atmosphere, it can dissolve in greater amounts in water that increases carbonic acid ,decrease the pH , which is **harmful to many organisms**, **especially the sensitive life stages such as the egg ,larval stages.**



2- **Weak respiration:** High CO₂ reduce O₂ in water for breathing.

3- **Reduced calcification:** corals, mollusks, plankton depend on calcium carbonate to form their shells or skeletons

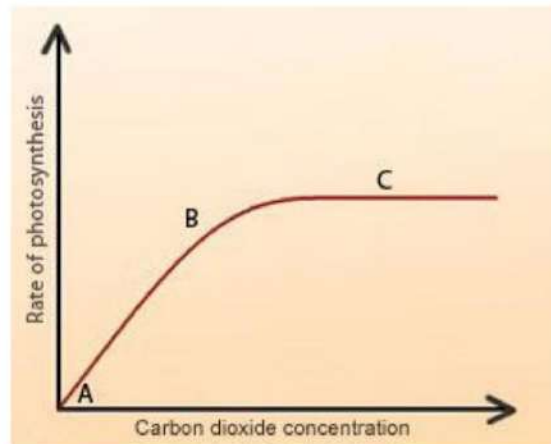
Increased CO₂ converts it into calcium bicarbonate that dissolves in water, dissolves their skeletons.



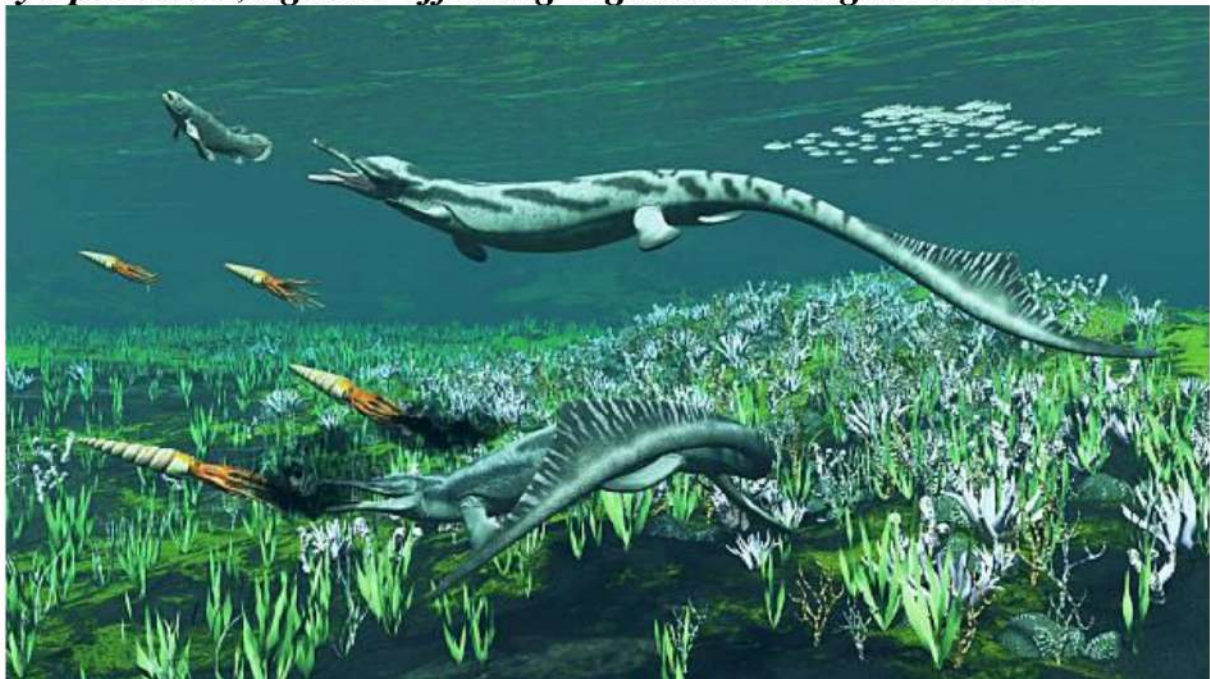
effect of CO₂ deficiency in water on organisms

1- **Reduced photosynthesis:** Aquatic plants ,algae need CO₂ for photosynthesis. Decreasing CO₂ limits their energy production.

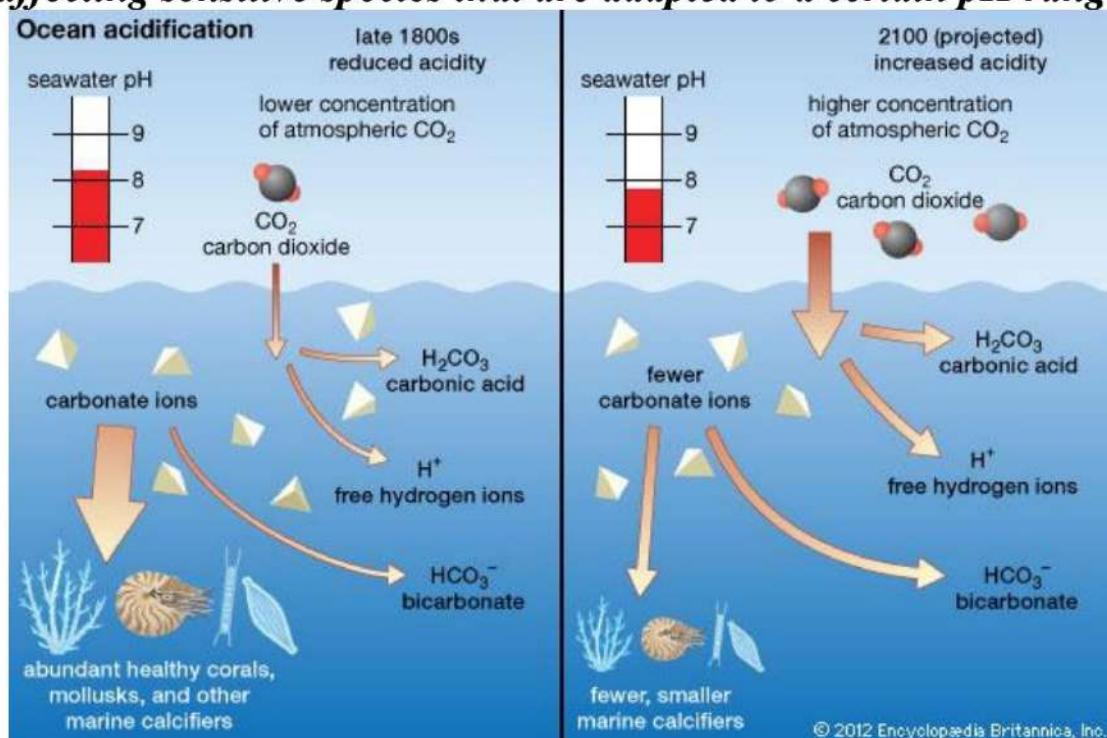




2- Effects on food chains: A change in CO_2 level affects productive organisms like phytoplankton, algae so affecting organisms at higher levels.



3- Disruption of pH balance: Low concentrations of CO_2 lead to an increase in the pH, affecting sensitive species that are adapted to a certain pH range.



Lesson 8

effect of light and solar radiation

Solar radiation is the energy produced by the sun.

It's the **primary source of energy** for most processes .

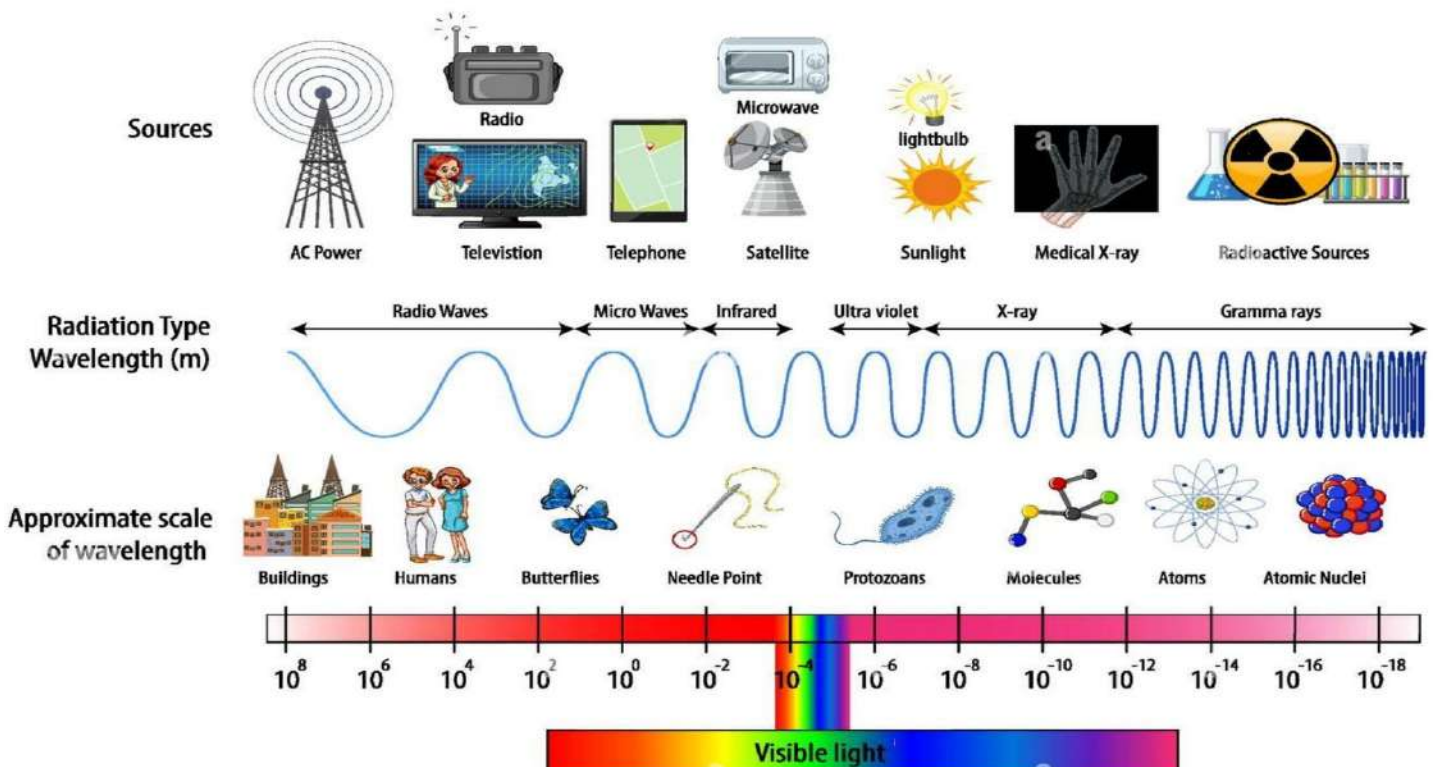
□ **Solar radiation can be converted into other forms of energy**

Visible light is a part of the electromagnetic spectrum,

Solar radiation propagates as electromagnetic waves that differ in wavelengths ,frequency .

Visible light is only a small part of this spectrum and is composed of different wavelengths, known as the visible spectrum colors (red- violet).

THE ELECTROMAGNETIC SPECTRUM



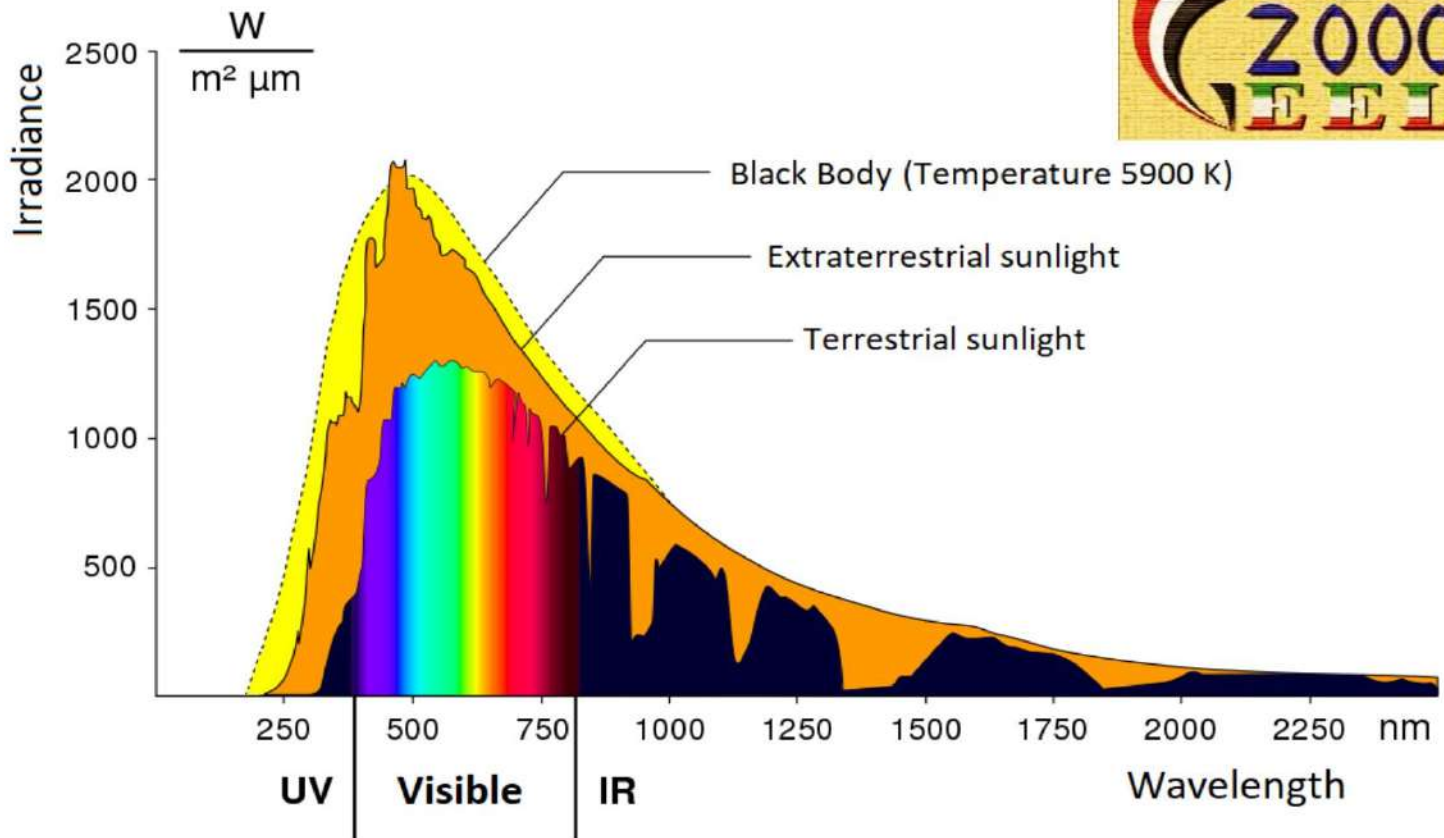
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www.alamy.com

Solar radiation reaching Earth is classified into

1) Direct: reaches the Earth's surface **without scattering.**

2) Indirect: scattered through the atmosphere.



The amount radiation reaching any location depends on:

- 1) *Geographic location*
- 2) *Season*
- 3) *Time of day*
- 4) *Cloud cover*
- 5) *Altitude*



Solar radiation effects on water

it directly affects the many layers of water, When it penetrates the water's surface, part of it is absorbed by :

- | | | |
|--|----------------------------|--------------------------|
| 1) <i>water</i> | 2) <i>suspended matter</i> | 3) <i>aquatic plants</i> |
| 4) <i>other part scatters in the depths.</i> | | |

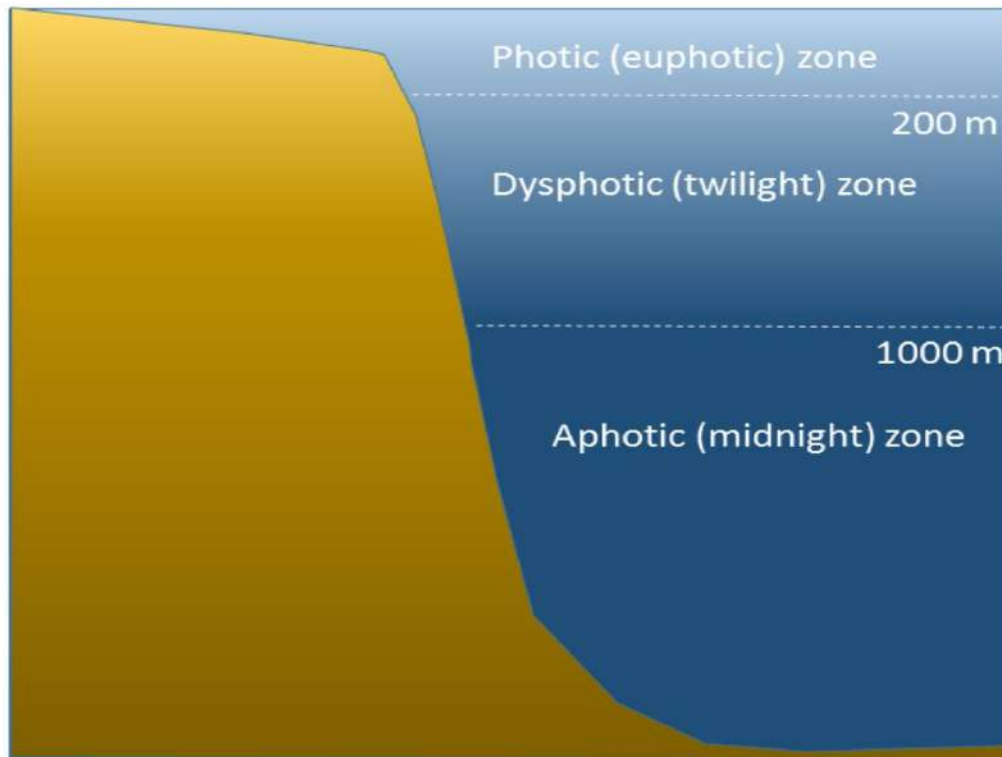
light zones in water

As the depth increases, the intensity of light decreases.

*This **light gradient** makes different zones in oceans:*

1) <i>euphotic (sunlit) zone</i>	2) <i>twilight (mesopelagic) zone</i>	3) <i>the aphotic (deep) zone</i>
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Marine organisms inhabit these zones according to their ability to adapt with that light.



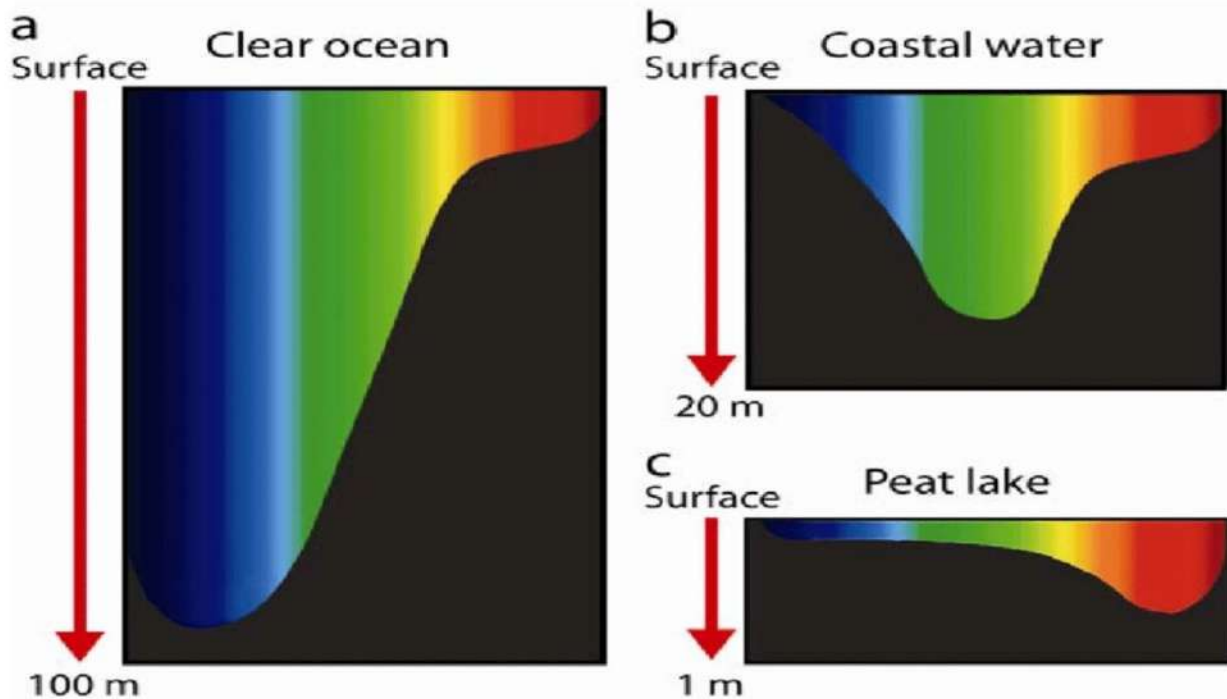
as sunlight hits the ocean, part of it is reflected into the atmosphere. The amount that penetrates the water depends on the angle of the sun's rays. greater amount penetrates the water when rays are perpendicular to the surface.

less light penetrates when the rays are inclined or tilted.

Water absorbs nearly all infrared energy within the top 10 cm of the surface.

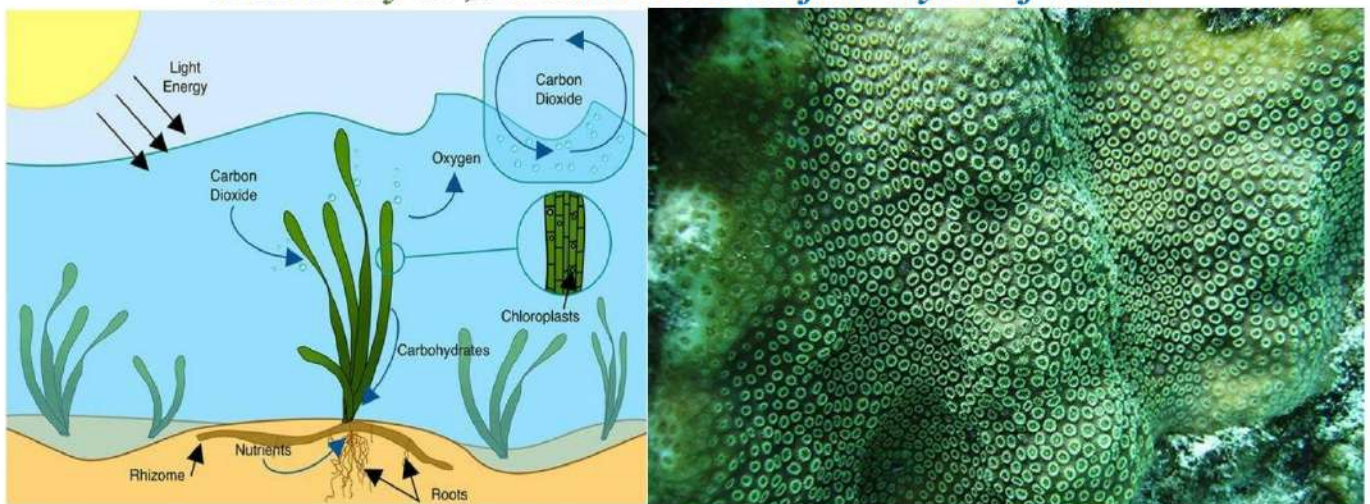
Depth affects also the light intensity

- (1) Light intensity decreases as the depth increases.*
- (2) At 10 m, more than 50% of visible light is absorbed.*
- (3) about 1% of visible light (blue spectrum) reaches a depth of 100 meters.*
- (4) When different colors of light penetrate ocean: warmer colors(red ,orange (with longer wavelengths)) are absorbed.*
- (5) cooler colors (with shorter wavelengths) are scattered.*



Photosynthesis in the aquatic

Many **autotrophic**(self-feeding) **organisms**(plants, algae, phytoplankton) depend on **photosynthesis** to convert solar energy into chemical energy to **produce organic compounds** needed for growth and critically depends on light availability so ,it occurs in the surface layers of water.



☐ Solar radiation and ecological Balance

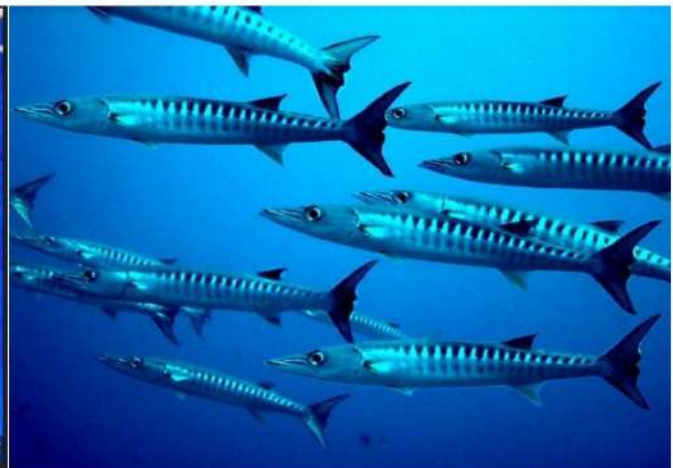
1. It doesn't only affect photosynthesis but also affects water temperature , the distribution of marine organisms
2. Organisms are unevenly distributed depending on their light energy needs.
3. Autotrophic organisms are abundant in the surface layers (coral reefs thrive in warm shallow waters near the equator) as solar radiation is available all year
4. radiation stimulates(boosts) the growth of symbiotic(co-exist) algae living within coral providing the coral with nourishment.



Effect of solar radiation on water temperatures

- *Warm waters in tropical regions attract specific types of marine animals that require certain temperatures to survive like:*

1) tropical fish such as tuna, barracuda live in warm waters



2) Cod prefer colder waters found farther from the equator.



Changes in solar radiation intensity



Changes in solar radiation intensity occurs due to :

1)seasonal changes

2)climate changes

it leads to disruptions in ecological balance, Like:

a)in polar regions: solar radiation is low or absent during the winter, photosynthesis rates drop significantly, affecting the food availability ,leading to decrease in the numbers of organisms that rely on photosynthesis, impacting the entire food chain.



b) global warming: causes rise in water temperatures, causing the death of coral reefs, affecting the marine organisms depending on coral reefs.



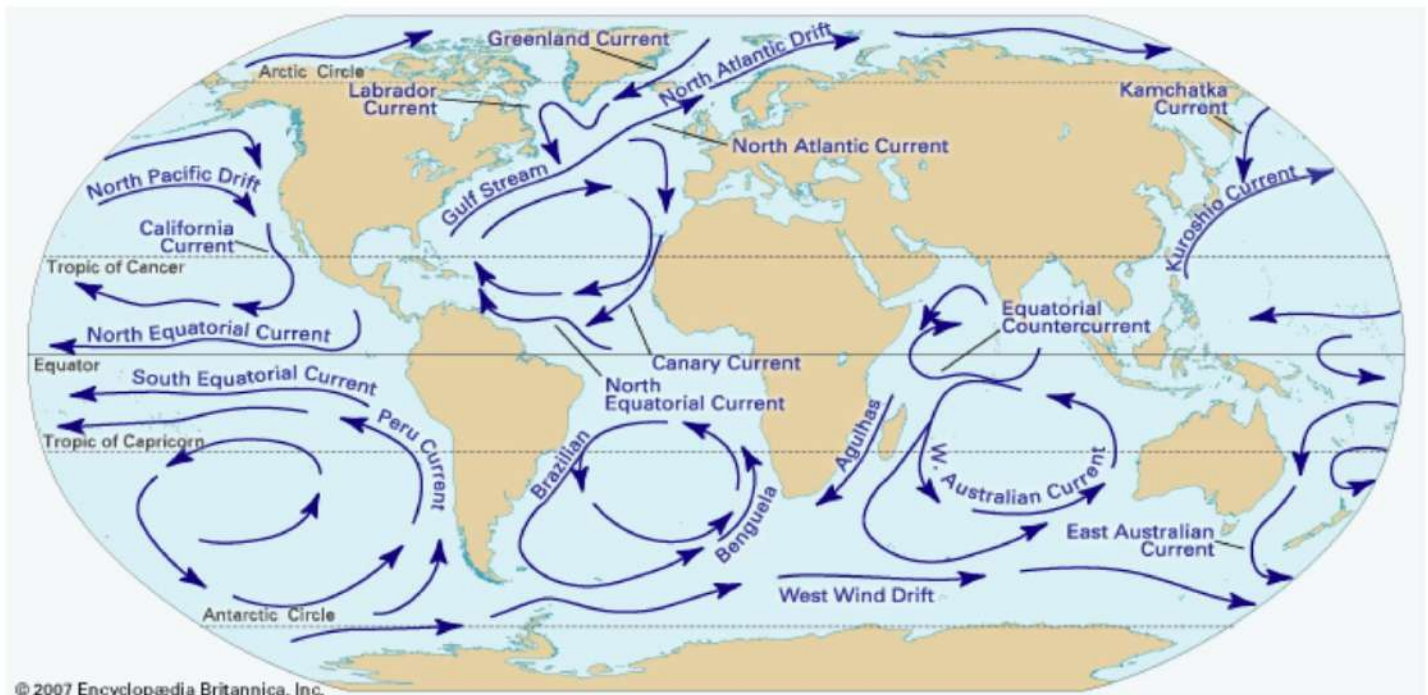
Effect of solar radiation on ocean currents

Solar radiation share in formation of ocean currents, as it:

1) distributes heat , nutrients throughout the oceans.

2) distribution of marine life, and make certain areas rich in food resources.

Like: the Gulf Stream carries warm waters from the equator to the North Atlantic, adjusting the climate in regions like Western Europe and enhancing marine biodiversity.



كيفية طباعة صفحات معينة من ملف معين مثلا ازاي نطبع الصفحات من صفحة 4 الى صفحة 9

